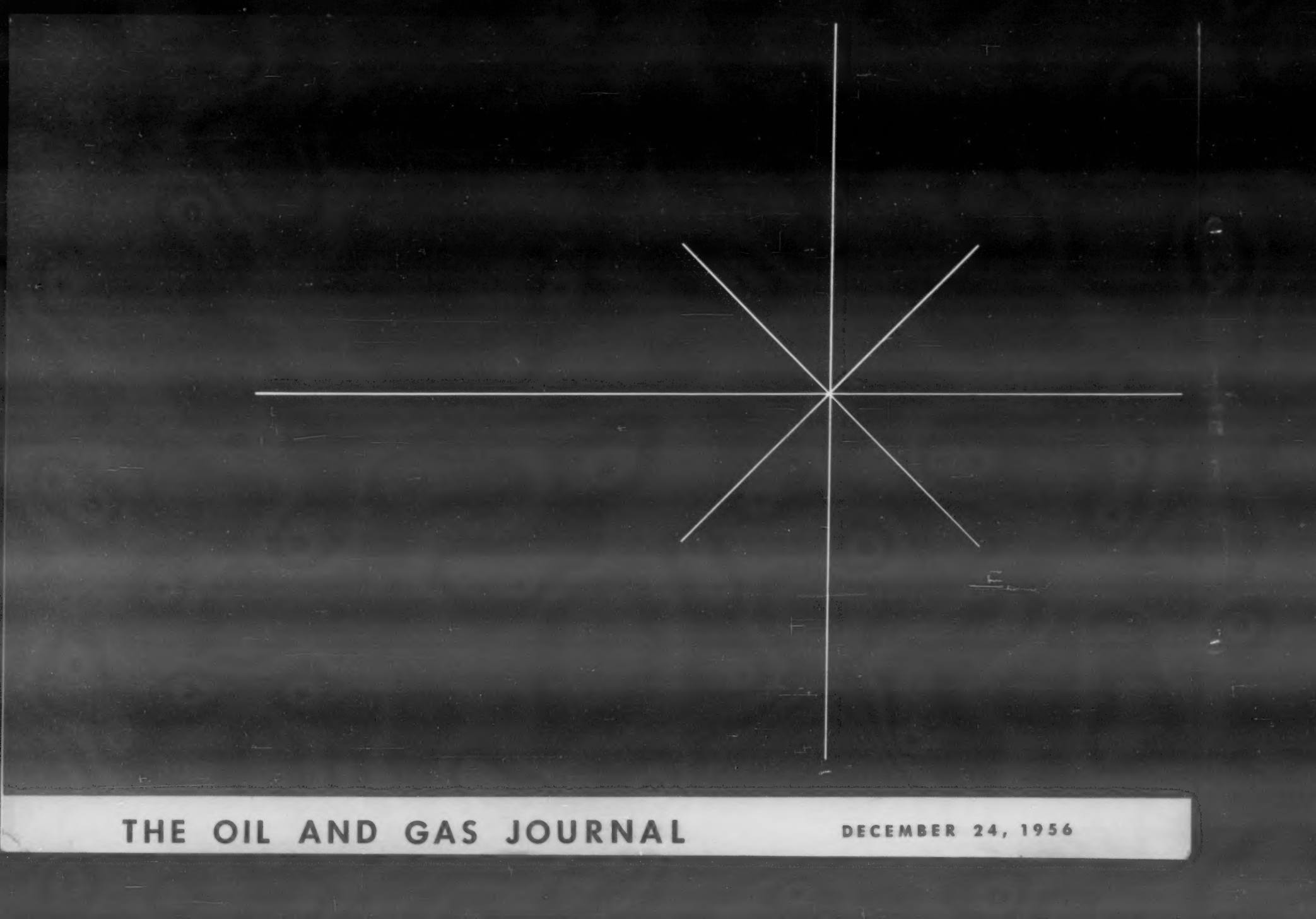
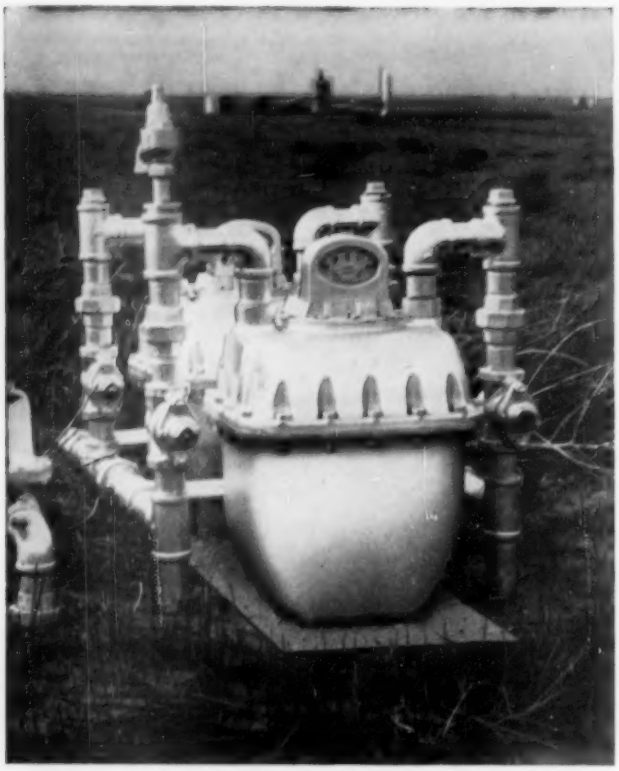
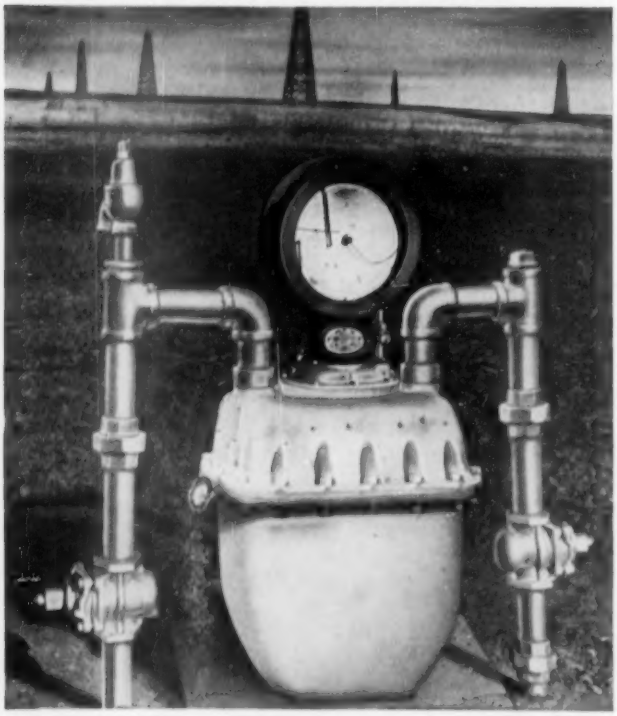


THE OIL AND GAS JOURNAL DECEMBER 24, 1956



(ABOVE) Installation of two Rockwell "800" meters in West Texas field with manifold controlled by Rockwell-Nordstrom valves.

(BELOW) Rockwell "800" meter with Combined Record Gauge measuring 75 lb gas in Kansas field. The valves are Rockwell-Nordstrom.



Recommended installation is off the ground and away from alkaline soil.

Portable, Corrosion Resistant Rockwell Aluminum Meters

MEASURE FIELD GAS

at up to 100 lb. working pressure

The Rockwell "800" is "made-to-measure" for gas sold or used on the lease. It weighs only 63 lbs, so is readily portable. The sturdy aluminum outer case withstands weathering and takes bumps and knocks in stride. There's a generous capacity rating of 1600 cfh at 4 oz inlet. This can be materially increased by measuring gas at higher pressures . . . up to 100 psi. Corrections for volume at high pressures are available with either a Rockwell Emcorector or a Combined Record Gauge. Write for full details.

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ROCKWELL "800" Aluminum GAS METER

A Glance Ahead . . . at press time

These Trends will make TOMORROW'S NEWS

More oil-field brines will soon be going back underground in California's San Joaquin Valley, where water cuts average 75 per cent. State authorities have been cooperative, but they insist pollution of arable lands and fresh water sources must cease. Operators in the Raisin City, Edison, and Fruitvale fields, which produce more than 100,000 bbl. of brine daily, are among the hardest pressed on the eastern side of the valley.

Another isomerization process will be introduced within the next week or two. The announcement will be made by a major design company.

The current play for Boscan crude is a sign of the times. This heavy Venezuelan crude runs 9° to 11° A.P.I. gravity and contains 5.4 to 5.5 per cent sulfur. Demand for asphalt, heavy fuel and lighter conversion products has been light until recent months. Now producers are selling all they can bring to the surface, at a recent 20-cent price increase. Production averaged 19,000 bbl. per day in 1953. This year it will hit 63,000 bbl. per day and is expected to top 80,000 bbl. next year.

Watch for a westward movement of Paradox basin exploration. The reason: Gulf's discovery 3½ miles southwest of Recapture Creek at the west end of the Aneth trend. By the same token, the Gallup sand play in the Bisti area of the San Juan basin should move to the south and east. Two discoveries of Anderson-Prichard and Shell, at Carson and 3 miles east of there, point the wildcat finger to the southeast of Bisti proper.

Rising royalty commitments threaten to cut further into the producer's margin in fields which once offered fast payouts. Indicative of the trend is a statement by Louisiana's Gov. Earl K. Long urging the State Mineral Board to go slow on granting new leases. By holding back, the governor said, leases may command one-fourth royalty rather than the present one-eighth.

Molecular sieves are getting a close look as a possible means of separating branched-chain and straight-chain isomers in the pentane to heptane range.

If they prove practical they may find use in the upcoming isomerization applications which will come into play as octane requirements rise further. Conventional fractionation of these close-boiling isomers is costly. Of the alternate means of separation, the uniform, microscopic pores found in some synthetic and natural zeolites show some promise. They literally sift hydrocarbon molecules; the straight chains pass through and the branched chains don't.

Better primary cement jobs and more successful open-hole plugs are claimed for a new cement decontaminant.

The product—three parts paraformaldehyde to two parts sodium chromate dihydrate—neutralizes the effects of contaminating drilling-mud additives which sometimes prevent a cement set. It is said to be effective against quebracho, starch, lignite, sodium carboxymethylcellulose (CMC) and monovalent salts of lignosulfonic acid. The decontaminant does not affect slow-setting properties obtained by calcium lignosulfonate.

The OIL AND GAS JOURNAL

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EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

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TECHNOLOGY–OPERATION

Drilling-Production

Kerr-McGee's New Submersible Barge **58**

By Ed McGhee

Kerr-McGee's new submersible barge has a number of advantages over older designs. It keeps the low-cost principle, but does away with side pontoons, stabilizing legs, piles, and other similar complications.

Quantitative Log Analysis—3 **62**

By Dr. R. G. Hamilton and Paul Charrin

The S. P. Curve is discussed, and determination of the quantities R_w, R_{mf}, R_{mf}/R_w, and SSP is outlined.

Elements of Field Processing—24 **78**

By Dr. John M. Campbell

Control of field booster compressors is an important factor in their operation. Most controls are designed to protect equipment and facilitate operation with minimum attention. Here is a typical scheme.

Foreman's Page **84**

Management

Classifying Communicators on The Job **76**

Here is an exhibit of bottlenecks and plugged pipelines in the communications system of industry.

Giving Orders . . . The Right Way **85**

A three-page foldout management report. The most important single thing to bear in mind about giving orders is that an order is a means to an end, to bring about certain desirable results. Follow these procedures for successful order giving.

Pipelining

Buy Power, or Make Your Own? **64**

By W. H. Stueve

To decide this, you'll need a satisfactory answer to the question, "What will be the relation between 'capacity factor' and 'energy-use factor,' (load factor) during the expected life of the project?" Here's how to get the answer to this question.

Pipeline Patrol—Construction Tables **95**

Refining-Processing

How Oil Volatility and Additives Affect Octane Requirement **69**

By F. S. Wood and C. C. Colyer

The octane requirement of an engine is influenced greatly by the motor oil used. Each proponent of the motor oil contributes. Volatility of the base oil, the organic portions of detergents and oxidation inhibitors, and the type of viscosity-index improver have a bearing.

Two-Way Radio For Refinery Use **75**

By L. F. Stanley and E. C. Williams

This is one of the more attractive cost-reduction systems installed at Indiana Standard's Whiting refinery. The system augments other communication systems by providing flexibility, mobility, and wide area coverage.

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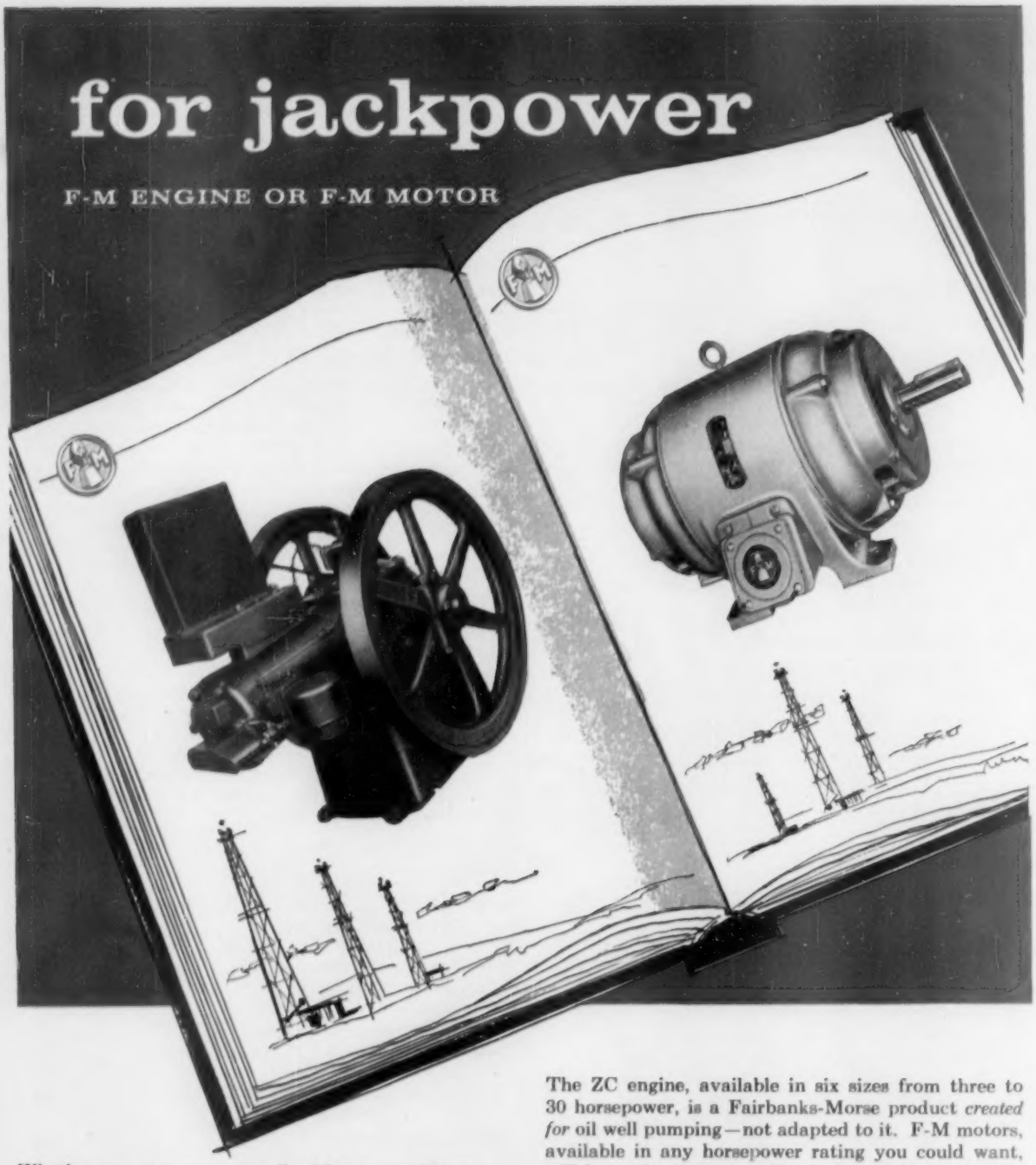
for jackpower

F-M ENGINE OR F-M MOTOR



Whether you pump your well with gas or kilowatts, there is the just-right Fairbanks-Morse prime mover for the job. Today's Fairbanks-Morse engines are the result of the design and manufacturing experience of 70 years; today's Fairbanks-Morse motors have a similar tradition of half a century.

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TO CEMENT HOT WELLS BETTER...

An ailment often begets its own cure. What better way to make the ideal cement for deep, hot wells... than with a product born of volcano-hot fire?

In search of the qualities needed to prolong pumpability when cementing casing under very high heat, Halliburton compounded pozzolans... products of high-temperature combustion in giant furnaces... with hydrated lime and set-control additives.

PERFECT FORMULATION FOR HOT HOLES

The result: Pozmix 140, adjustable formulation for cementing casing under temperatures of 140° to 400°F or higher. Pozmix 140... slow-thickening with low friction loss while displacing, flexible in weight, excellent strength buildup characteristics and remarkable durability.

LITTLE AFFECTED BY TIME AND FORMATION CHEMISTRY

After setting, Pozmix 140 is a totally reacted material, highly resistant to leaching or attack by underground waters. Deterioration due to temperature, pressure and other well conditions is reduced to a minimum.

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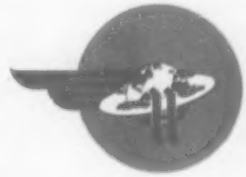
In spite of the extra protection afforded by Pozmix 140, it actually is more economical than conventional cement formulations! To get a better deep-hole cement job at agreeably small cost, call your local or district office of the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

COMPLETE DATA SENT ON REQUEST

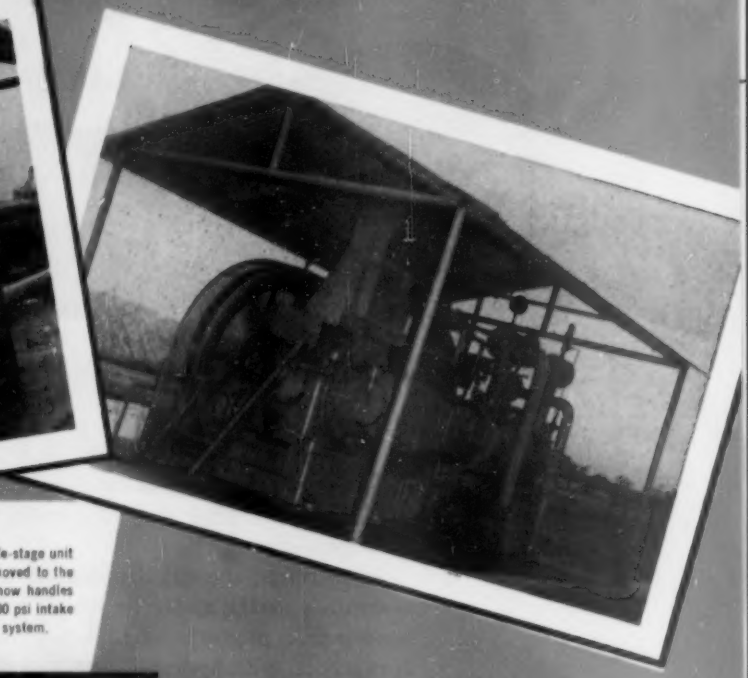
Get this valuable information for your Halliburton Service File



HALLIBURTON CEMENTING SERVICES

251 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

Any way you look at it-



This Model OWL-50 two-stage unit was first set up as a single-stage unit for gas lifting one well near Refugio, Texas . . . then later moved to the Hobson Field and changed over to two-stage operation. It now handles about 250,000 cubic feet of gas per day with approximately 30 psi intake and 580 psi discharge pressures as part of a 15-well gas-lift system.

Lorain OWL Compressors

Direct Connected

...give you extra advantages in the 20-50 hp range

UNITIZED CONSTRUCTION—Two-cycle, single-cylinder, wet-liner-type Lorain gas engine drives the compressor directly from the extended end of the engine crankshaft. Both units are mounted side-by-side on a strong cast-iron sub-base and working parts are fully enclosed in a heavily-ribbed one-piece frame, requiring minimum protection from the weather. Radiator for cooling both units, together with safety controls, etc. are mounted integrally.

SLOW SPEED—Both engine and compressor are of the slow-speed type, designed to give continuous full-load service with minimum field maintenance. Piston-type compressor incorporates standard crosshead construction. Mechanically-operated forced-feed lubricator has individual feeds which assure adequate lubrication at all operating speeds.

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Saddle type wedge gate valves are easy to take apart and are particularly suitable for lines requiring frequent cleaning. Walworth Saddle-Type Wedge Gate Valves are available in a variety of designs including OS & Y; Inside Screw Rising Stem, and Sliding Stem Quick Opening types—in Bronze-Mounted, All-Iron, and Ni-Resist. All types are designed to permit repacking under pressure in either the open or closed position.

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CABOT ADJUSTABLE-CRANK Series structure capacities are from 7,000 to 32,000 pounds maximum polish rod load. The flood lubricated Sykes-cut herringbone gears are rated (API) from 40,000 to 456,000 inch-pounds. ILLUSTRATED HERE: Upper right, AC15-114D, polish rod 15,000; peak torque 114,000. Upper left, AC13-114D, polish rod 13,000; peak torque 114,000. Lower left, AC9-40D, polish rod 9,000; peak torque 40,000.

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For Blanketing Fire in Chemicals, Gasoline, Oils

These pictures were taken at Robins Air Force Base in Georgia during acceptance tests of a Grinnell ProtectoFoam System. Above, a man slogs through foam to check the spray pattern produced by over 800 nozzles discharging 75,000 gallons of foam per minute.

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ProtectoFoam is only one of many Grinnell Fire Protection Systems designed for special hazard application. For unbiased advice on your fire protection problems, write to Grinnell Company, Inc., 256 West Exchange Street, Providence, Rhode Island.

Foam flows under aircraft to form a complete blanket.

Truck breasts hub-deep foam blanket outside hangar. Foam will dry out and disintegrate to a powder.

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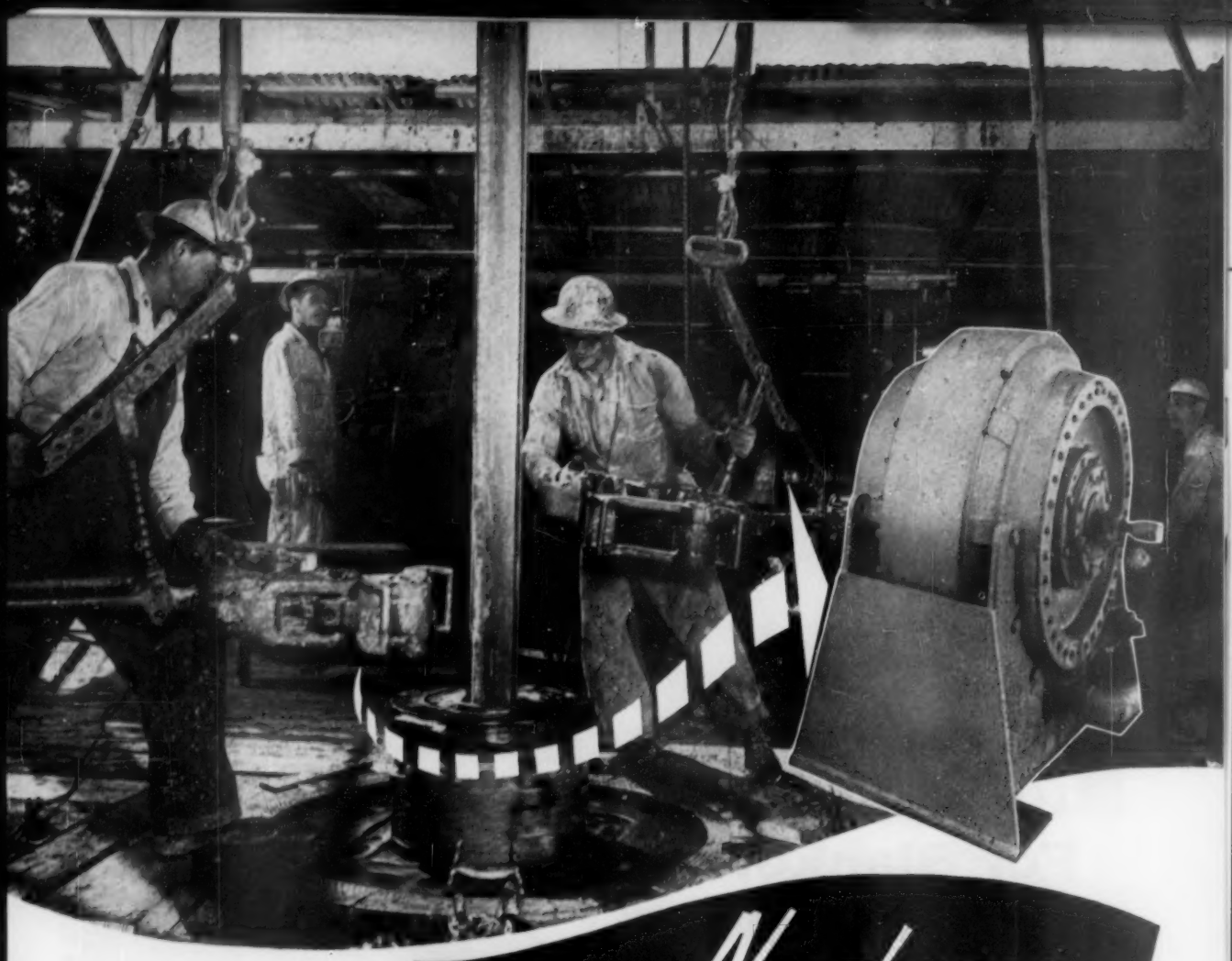

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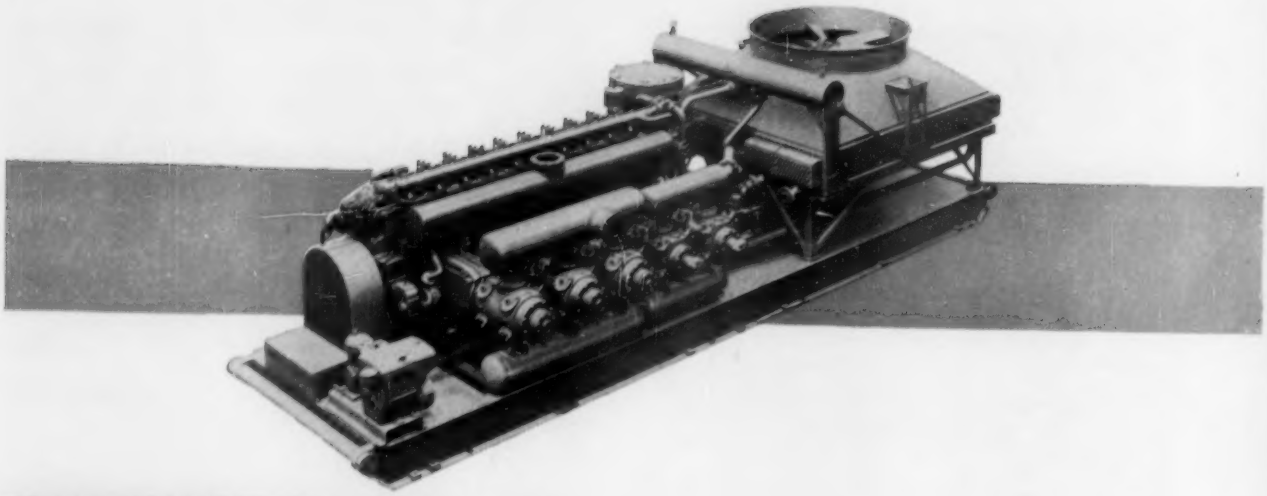
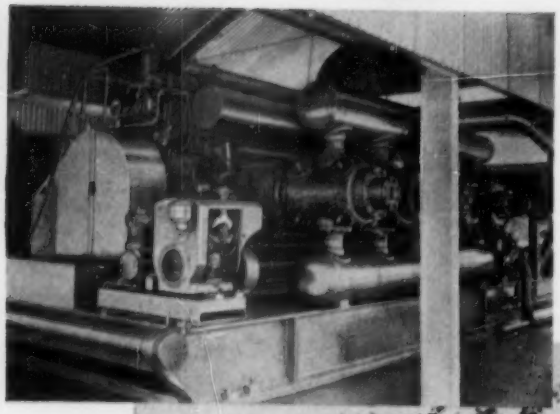
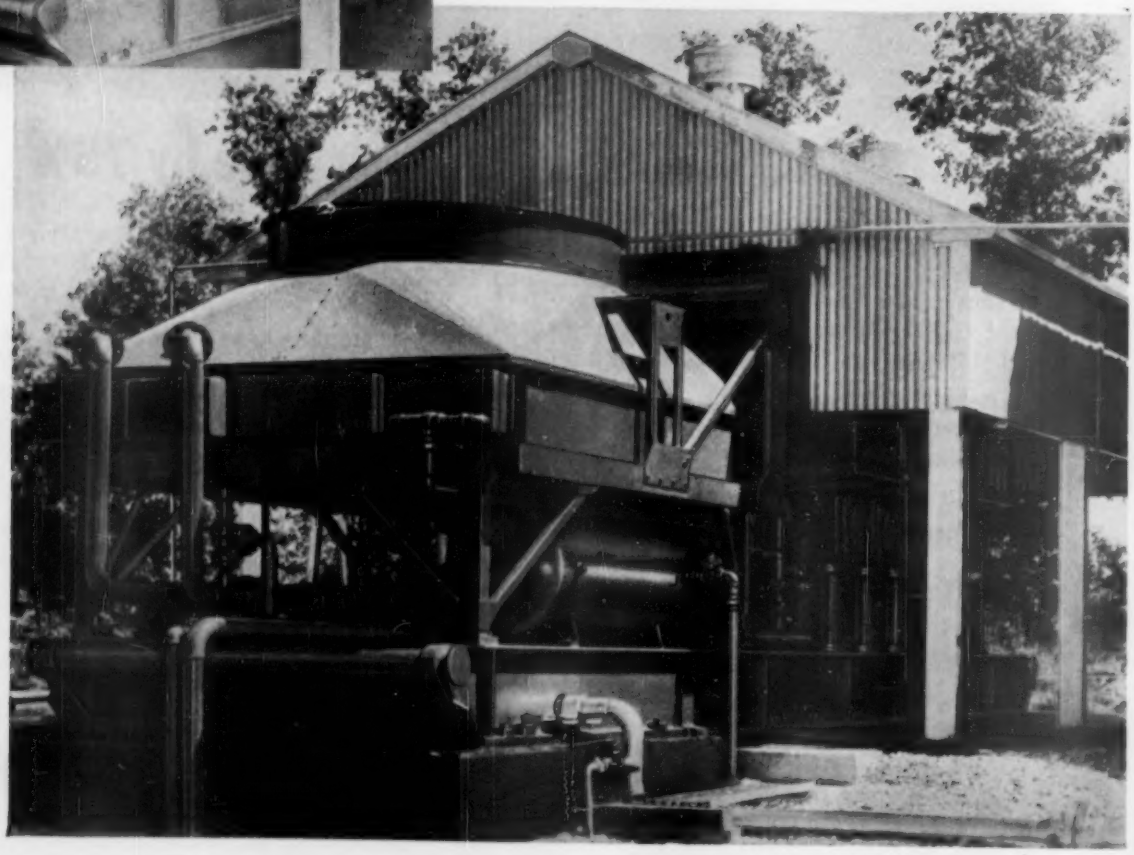




"Highly



A performance report from
The La Gloria Corporation
on the First **Clark**
HMAB-10 "Midget Angle" packaged
compressor station installation

satisfactory"

Now over 7000 hours on stream

After 7000 hours of hard 24 hour a day service the performance of the first HMAB-10 Midget Angle installed is reported as being "highly satisfactory." There has been a complete absence of mechanical failures with only routine maintenance required.

The HMAB-10, installed at Waskom, Texas, is a completely self-contained packaged compressor station developing 550 bhp. The La Gloria Corporation is using it to gather gas at 50 psig. and compress it in two stages to 980 psig. Subsequent to after-cooling, the gas is piped to a gasoline plant where it is stripped and sold to a pipeline company.

Similar in appearance to the smaller HMA, the new unit incorporates the basic design features of the HMA as well as many new innovations. Foremost of these is a new radiator and hydraulic radiator drive. Both the radiator and drive have completely measured up to expectations with flawless operation.

Substantial savings in erection time were realized at Waskom because the HMAB-10 was delivered as a factory tested, completely assembled unit. Balanced/Opposed design greatly reduced foundation needs.

One very important consideration for users of this 550 bhp. unit is the fact that it is equipped with five compressor cylinders as standard equipment. If field pressures drop excessively, conversion to three-stage operation is easily accomplished. There is also ample physical space in the radiator to add another cooling section for additional intercooling. Demand for this new unit is heavy but new production facilities will soon be ready to speed deliveries. Be sure to get all the facts on the HMAB from your nearest Clark representative.

CLARK BROS. CO., OLEAN, NEW YORK
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Offices in Principal Cities Throughout the World

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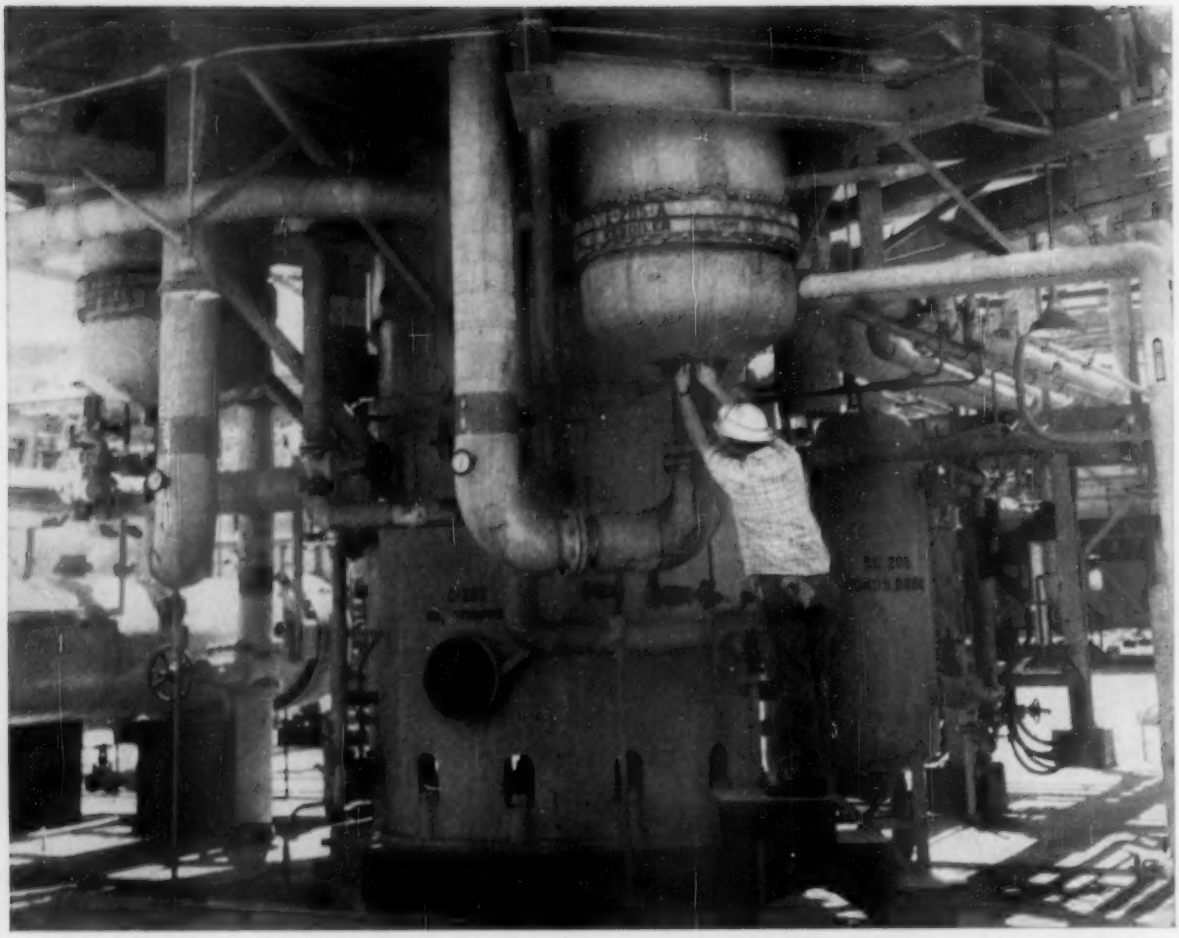


Monel-protected . . . Reboilers on this column used for stripping CO_2 from monoethanolamine solutions at a Shell Chemical anhydrous ammonia plant contain Monel alloy tubes. Tubes have shown no significant corrosion in two years.

Little to do but turn the valves when MEA reboilers have Monel bundles

Shell Chemical checks CO_2 corrosion . . . descales only once in two years

This workman never had it so good.

Used to spend a good deal of time with the two reboilers on this column which strips CO_2 from "fat" monoethanolamine solutions. First he would dismantle one. Descale. Hook up again. Before long it was the other's turn. Every three to six months new tubes had to go in.

But that all stopped in 1954

Shell Chemical put in Monel* nickel-copper alloy tube bundles.

Since then, the reboilers have been descaled but once. What's more, deposits appear to contain no corrosion products . . . just stream precipitates. Tubes look like new . . . have never been replaced.

Take a leaf out of Shell Chemical's book

Inco's Corrosion Engineering Section will be glad to help you check into corrosive conditions within your MEA reboilers.

If Monel alloy is indicated for the tubes . . . and there's a good chance that it will be . . . put it in!

Then relax. Look at the meters. Turn a valve once in a while.

*Registered trademark

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

INCO Nickel Alloys

Monel . . . *for minimum maintenance*

Another new development using

B.F.Goodrich Chemical *raw materials*

Hycar rubber parts form the liner sections of the Dorrco D-Sander, manufactured by Dorr-Oliver Inc., Stamford, Conn.

Hycar rubber helps cyclone remove sand from drilling fluid

THIS machine is designed to centrifugally separate sand from drilling mud—sand too fine to be removed by shakers or mud tanks. Sand that can cause expensive damage to mud pumps, threads, roller bits, and other parts.

But choosing a lining material that could withstand the abrasive stream of sand and mud, plus entrained oil and gas, was a problem, until they tried Hycar rubber. Molded parts of this oil-resistant, heat and abrasion-resistant rubber have performed perfectly in service covering almost two years. In one case, a "D-Sander" removed over 1500 barrels of sand from the mud while drilling a single well. When the machine was inspected, virtually no wear of the Hycar liners could be detected.

This remarkable material has wide application in gas and oil field service—for liners, packing elements, seals, valve seats, cylinders, and other parts subjected to heat, pressure and abrasion, and fluid attack. Where you need a tough, resilient material investigate Hycar. For complete information write Dept. EN-7, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar
American Rubber

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

No problems here !

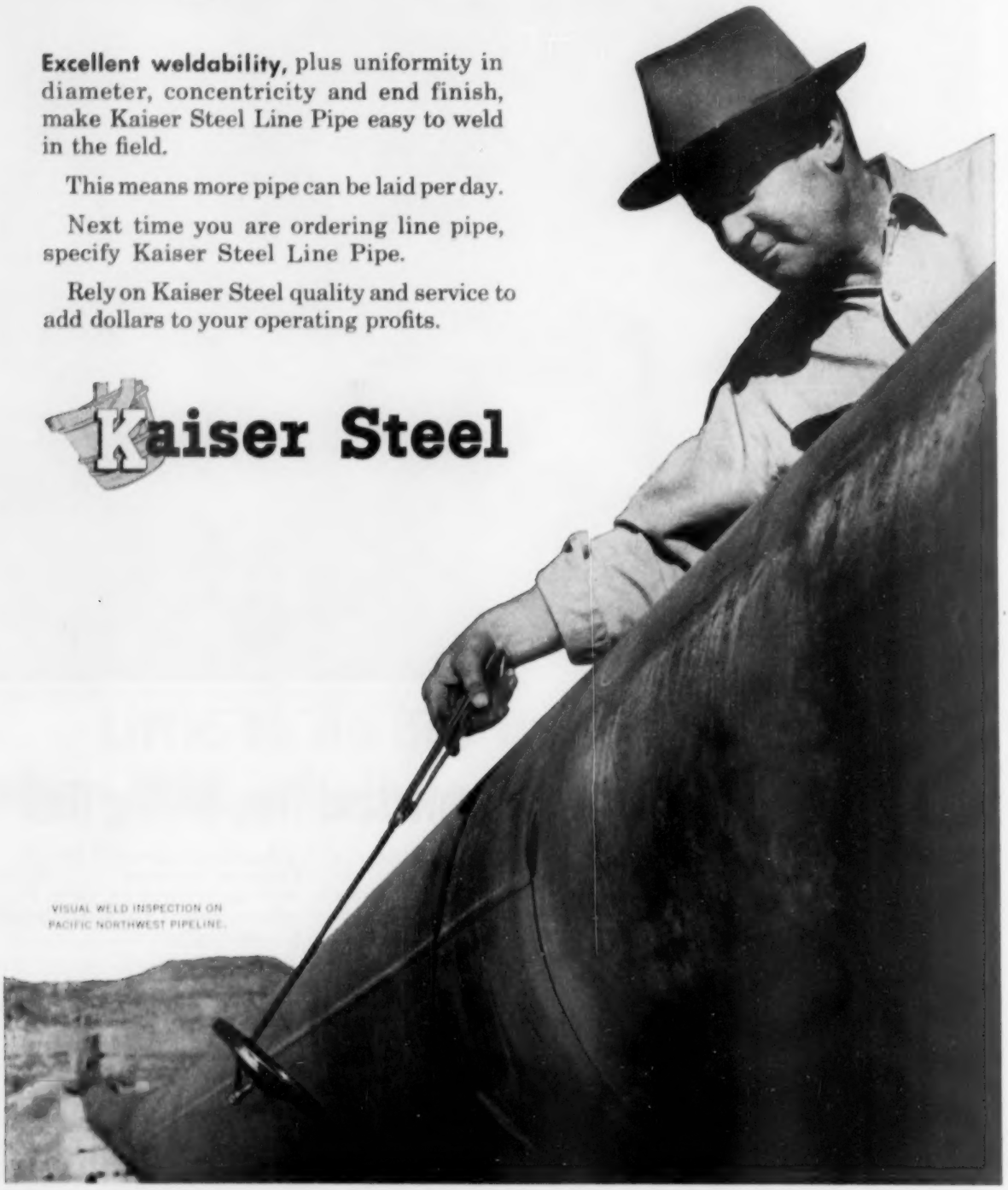
Excellent weldability, plus uniformity in diameter, concentricity and end finish, make Kaiser Steel Line Pipe easy to weld in the field.

This means more pipe can be laid per day.

Next time you are ordering line pipe, specify Kaiser Steel Line Pipe.

Rely on Kaiser Steel quality and service to add dollars to your operating profits.

Kaiser Steel



VISUAL WELD INSPECTION ON PACIFIC NORTHWEST PIPELINE.

Steel Mill Products: plates • hot rolled strip and sheet • cold rolled strip and sheet • tin plate • continuous weld pipe • electric weld pipe • alloy and carbon bars • bar shapes • structural shapes • semi-finished steels • pig iron • ingot molds • coke by-products • **Fabricating Division:** steel fabrication for construction, aircraft, missile and other industries • expanded fusion weld pipe • reinforced concrete pipe • tanks • For specifications, write: **KAISER STEEL CORPORATION** • **Los Angeles** • **Oakland** • **Seattle** • **Portland** • **Phoenix** • **Denver** • **Tulsa** • **New York**

Quick check on API chain quality:

Look at pins and bushings

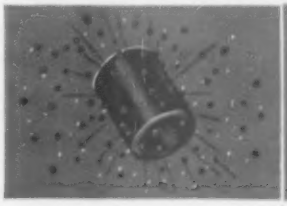
Note the polished, satiny surfaces on alloy steel pin *and* bushing. *Grinding* the inside and outside of the bushing, as well as the pin, to a fine micro-inch finish helps assure long chain life.

LINK-BELT grinds both —eliminates wear-producing surface irregularities

FOR true chain precision and maximum endurance, appearance grinding is not enough. In the machining of pins and bushings for Link-Belt API chains, nicks and tool marks which may be starting points of fatigue are eliminated. Then, too, Link-Belt cadmium plates the pins to prevent rust and to avoid corrosive fatigue in these flexing members. These cadmium-plated pins go into service in factory-finish condition no matter how long the chain is stored.

Link-Belt API (SS type) chains have unequalled distribution throughout the oil country . . . and distributors are backed up by strategically located Link-Belt warehouses. These leading supply stores can show you why Link-Belt API chain is first choice in the field. And ask for a copy of Catalog 2680 on the broad Link-Belt line of oil field equipment. Or call your nearest Link-Belt office.

3 of many "EXTRAS" you get as standard on Link-Belt API chain



SHOT-PEENED rollers hammered by steel balls have added impact resistance.

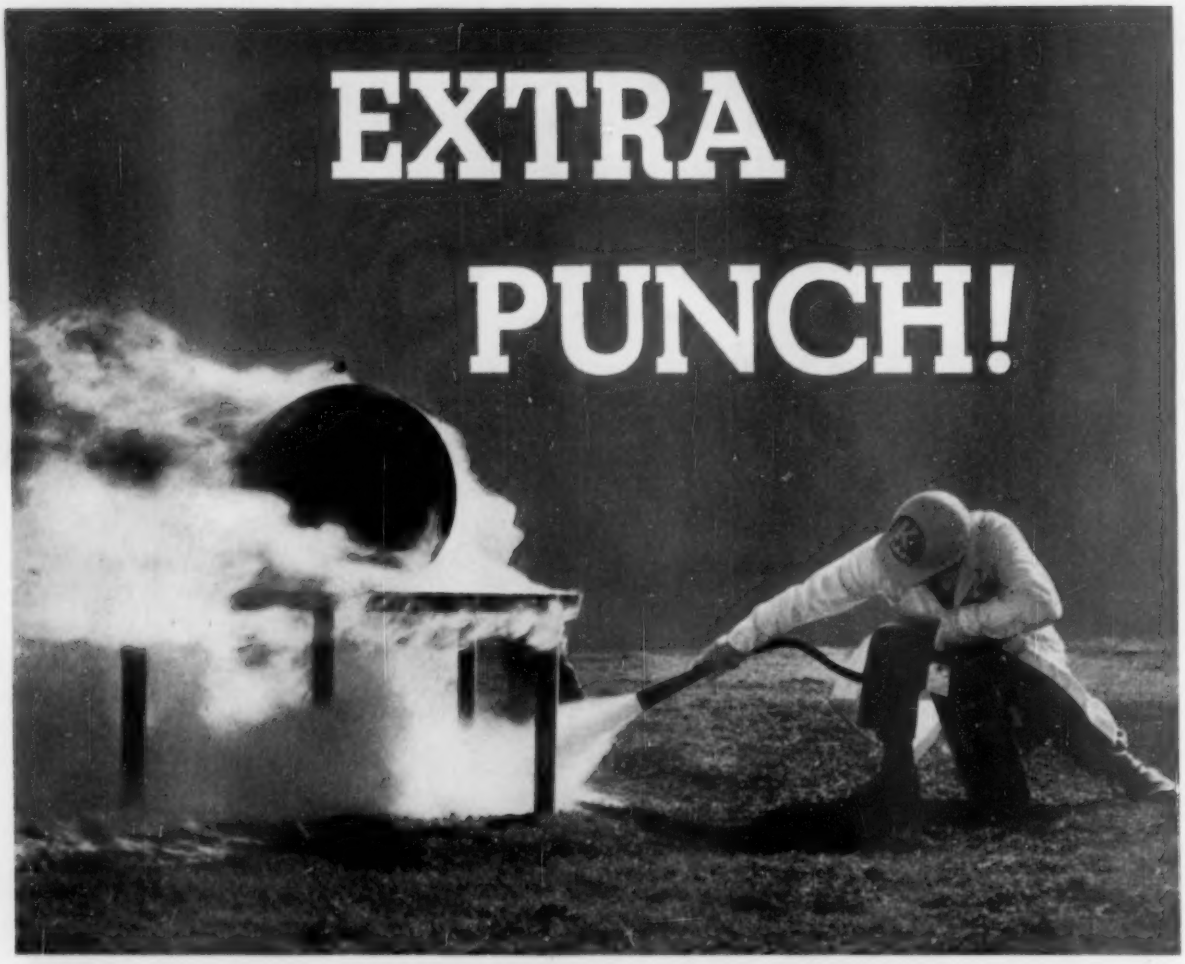
COTTERS with patented grooved shank fit tightly in pin hole. Pin is easily removed.

MORE CONVENIENT. Dust-proof, sturdy boxes simplify handling, identification.

LINK-BELT

CHAINS AND SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Shreveport, La., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields. 14.070



OKLAHOMA DEMONSTRATION PROVES POWER OF KIDDE DRY CHEMICAL EXTINGUISHERS!

TULSA, OKLA. — Recently an audience of more than 250 oil company safety personnel witnessed more than thirty fires of the type frequently encountered in industrial plants, refineries and oil fields.

All day long, fire after fire was ignited, allowed to reach blazing proportions, and was then extinguished quickly and efficiently with Kidde portable extinguishers.

Star performers of the show were the Kidde pressurized and cartridge-operated dry chemical models — especially effective against fires in oil, gasoline and other flammable liquids. Available in capacities of 5 and 10 pounds, the pressurized portables feature dust-and-moisture-proof gauges, and can be charged easily to U.L.-approved working pressure of 150 psi by means of an air pump. For extra power, the 10-pound model may be boosted to *250 psi!* Like the 20 and 30-pound cartridge-operated models, they have an easy-to-use trigger grip that insures fast, dependable fire-fighting action even in the hands of an inexperienced operator. All of the Kidde dry chemical extinguishers have Kidde's patented diffuser horn to give a wider coverage than ordinary dry chemical units.

For more information about the complete Kidde Dry Chemical Line, and how it can protect *you* from fire, write today for Kidde's P-8 Extinguisher Catalog.

Kidde

Walter Kidde & Company, Inc.
1254 Main St., Belleville 9, N. J.
Walter Kidde & Company of Canada Ltd., Montreal — Toronto

He's Paving the Way for a Good Drop Forging

Not all craftsmen paint pictures or make watches. Here's one whose artistry helps shape intricate dies for Bethlehem drop forgings.

That's a job requiring infinite patience, a skilled touch, and a world of experience. Bethlehem die-sinkers qualify on all counts, and the results of their craftsmanship are clearly evident in the finished forgings.

They're a capable group, these die men. But you could say the same thing for everyone concerned with Bethlehem drop forgings. In our fully integrated operation, which starts with the making of the steel, each step is handled by experts. Men whose standards are high.

Yet Bethlehem prices and deliveries are fully competitive. It will be worth your while to investigate our services. May we have the opportunity to quote on your requirements?

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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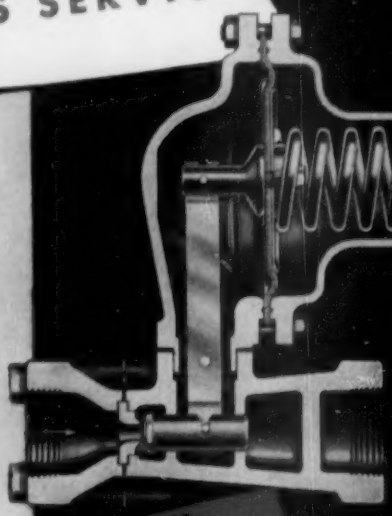
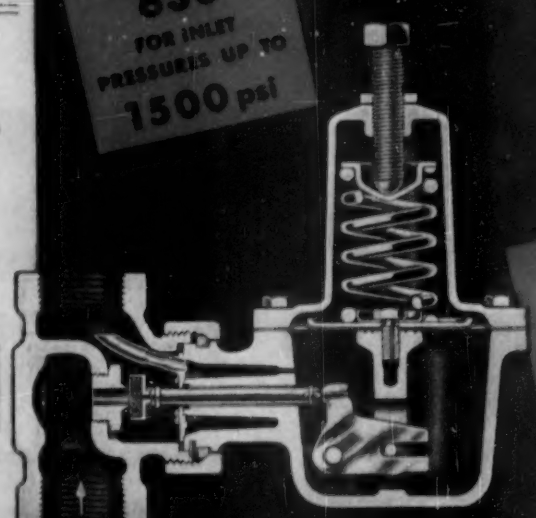


Fisher's famous Big Joe Type 630 is the best regulator the industry has for rugged high pressure jobs. It's ideal for countless numbers of industrial applications where it is necessary to reduce high pressure air or gas to a constant supply pressure of 5 to 200 psi. Valve disc material: Up to 200 psi inlet BunaN is furnished. 200 psi inlet and above, Nylon is furnished. (Teflon is available when specified.)

Available in 1" and 2" sizes for inlet pressures up to 1500 psi and outlet pressures 5 psi to 200 psi.

TYPE 630 FOR INLET PRESSURES UP TO 1500 psi



TYPE 620 FOR INLET PRESSURES UP TO 750 psi

For real economy the Fisher Type 620 pounds to pounds regulator is used on same applications as 630 "Big Joe" where pressure and flow requirements do not exceed 750 psi and reduced pressure not above 100 psi.

For inlet pressures up to 750 psi with malleable iron or cast steel body; up to 150 psi with cast iron body. Outlet pressure ranges: Type 620—3 to 60 lbs. (4 springs). Type 621—3 to 100 lbs. (5 springs). Valve disc material: BunaN when inlet pressure is 300 psi or less, and Nylon when inlet pressure exceeds 300 psi.

Sizes: ¾", 1" and 1¼" with cast iron or cast steel body. ¾" and 1" with malleable iron body.

FISHER GOVERNOR COMPANY

MARSHALLTOWN, IOWA
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LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

FISHER Since 1880

GUIBERSON SWABS DO A

GOOD LOW COST JOB!

GUIBERSON'S Type J

Type L

Type GW

Here are three swabs capable of swabbing all sizes of tubing and drill pipe — in a minimum of time — making them most economical and efficient for routine swabbing. Many other types of Guiberson cups are immediately available for *specific* and *unusual* swabbing problems.

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ESTABLISHED 1919
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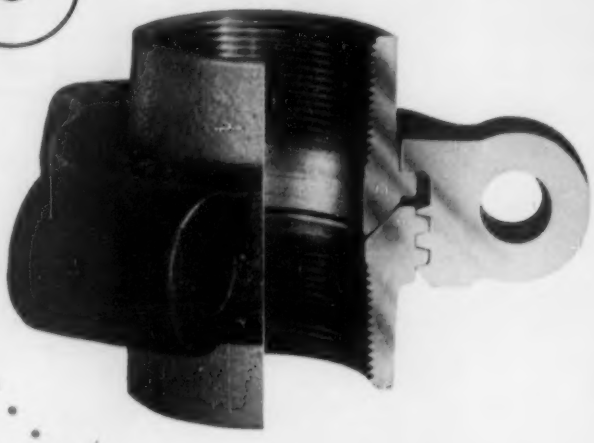
Sold by
Oil Field Supply Stores
Everywhere

THE 3 MOST IMPORTANT FUNCTIONS OF A UNION



LEAK-PROOF SEALING—
EASY MAKE-UP AND BREAK-OUT—
LONG LIFE are basically the most important functions of a union. All are synonymous with Weco Unions.

Leak-proof sealing is the result of Weco's ball and cone seat that forms a metal-to-metal surface unequaled for positive sealing. Easy make-up and break-out is provided by Weco's precision machined Acme threads. The long life of Weco Unions comes from sturdier construction of sub ends and wing nuts that can take the toughest treatment a worker can hand them—and come back for more—month after month.

These time-and-money-saving functions make Weco your best union buy today. Get them at supply stores everywhere.

U-1-56

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HOUSTON, TEXAS

WECO

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION

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They Say—

Consumer's Best Protection

"For the consumer, there is no better protection than intense competition. . . . We must be aware that some of the greatest misunderstanding growing out of conflicting concepts of competition exists within our own industry. It is from within the industry that many of the complaints originate which lead to charges of anticompetitive, or monopolistic action.

R. G. DUNLOP

"... Marketing in the oil industry is the target for reactionary proposals of great variety, including public-utility control and divorcement. They would set the oil industry back 40 years . . . It seems strange, in this jet age, to hear someone shout, 'Get a horse!' I conceive it to be our job to help update the antique ideas—to help keep America progressive."

Robert G. Dunlop, president, Sun Oil Co., in a speech before the oil industry Tires, Batteries, and Accessories (TBA) Group, St. Louis.

Key to National Defense

"U.S. production of crude oil, now about 7.1 million barrels a day, may be upped by 800,000 to 850,000 bbl. a day to meet the new Western European needs. This will be possible because of the enlightened self-interest of the oil producing states and the oil industry.

"Not only do the oil-producing states individually have conservation laws of varying strength, they also are joined in an Interstate Oil Conservation Compact, submitted many times to Congress and always approved by it. The federal Government has cooperated by imposing penalties on interstate shipments of 'hot' oil—crude produced in violation of state conservation statutes. The U.S. Interior Department has conducted its own conservation program.

"Some critics have called this combination of conservation efforts a price-fixing gimmick. Some have damned the idea that a man must, for the general good, hold down production of his oil well to a specified amount over a fixed period of days.

"But the fact is this conservation pro-

gram is a bulwark of our national defense. And now, in these troubled times, it is going to assist our friends in Western Europe who are already experiencing gasoline and oil rationing."

Editorial in the New York World-Telegram and Sun.

Dual Production in Saskatchewan

"The Saskatchewan Department of Mineral Resources does not look with favor upon authorizing production from two separate formations, through one well, except where it may be shown that it is uneconomic to do otherwise, but there are cases where it may be in the public interest.

"Completing a well to produce from two different depths is a highly complicated operation and there have been many failures. If the operation is successful, oil is produced more economically than if the company had to drill two wells, but the business of prevention of commingling of the production from the two depths is difficult.

"There are a number of arguments against dual production. From the conservation standpoint and in making reservoir studies it is essential to know how much oil comes from each formation; since dual production equipment is very complicated, accurate records are difficult to keep. Many of these formations have salt water and other substances mixed with the recovered oil and commingling of these may depreciate the end product. If dual production is not carefully managed pressures in the involved pay zones may be dissipated and the ultimate recovery reduced."

J. H. Brockelbank, Saskatchewan, Department of Mineral Resources.

California Conservation

"During the heated controversay over Proposition 4 . . . there was substantial agreement by proponents and opponents on one question: That there is need in California for some regulation to prevent wasteful development of the state's oil fields, including the so-called 'tidelands.'

"The legislature will meet in January, and if the oil interests of the state will cooperate, a measure which will at least approach the problem constructively can be enacted.

". . . We believe that those in the oil business know it best, which is one of the reasons this paper views with some disfavor efforts by politicians to regulate it. Secretary of the Interior Ickes was, all during the Roosevelt administration, seeking to control the oil business from Washington. We opposed that and we doubt that Sacramento politicians could do a better job than could Washington.

"But we are convinced that the oil operators of this state, taken as a whole, are not only competent to regulate the industry properly but that they will act in the public interest; if only because in the long run what is good for the State of California is good for the oil business.

"One of the reasons we favored Proposition 4 was that it provided for a large measure of voluntary self-government and this feature should be retained in the regulations to be adopted by the legislature.

"Our interest as a state, and as citizens of an oil producing state, is that extraction of oil shall be as nearly total as technology permits; we do not want our oil fields produced in such a manner that they will be exhausted prematurely or wastefully. . .

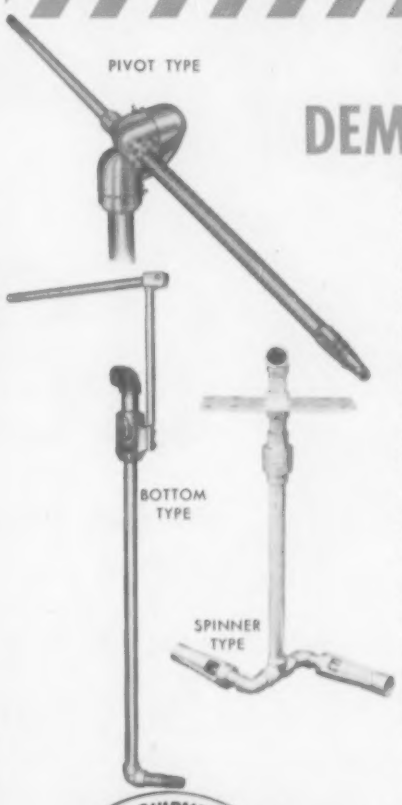
"We need conservation . . . with conservation defined not as locking up of assets where no one can get at them but as the intelligent and far-sighted exploitation. It is up to the legislature to provide it; and it is up to both sides in the recent bitter quarrel to cooperate to this end."

Editorial in the Los Angeles Times.

for Proper Mud Control

there's a Proper

DEMCO MUD GUN



PIVOT TYPE

Designed to handle all mud mixing jobs, in both steel tanks and earthen pits. Spin-proof and fully adjustable to any position in both vertical or horizontal planes.

BOTTOM TYPE

Provides maximum jetting action where needed. Rugged Swivel Joint rotates on double rows of ball bearings. Swing handle has boxed joint. Replaceable, hardened steel jet nozzle.

SPINNER TYPE

Swivel joint for continuous rotation. Keeps mud rolling and weight material in suspension. Exclusive combination of jet and venturi creates multiple mixing action.

Demco Mud Guns are designed for 3,000 lbs. working pressure

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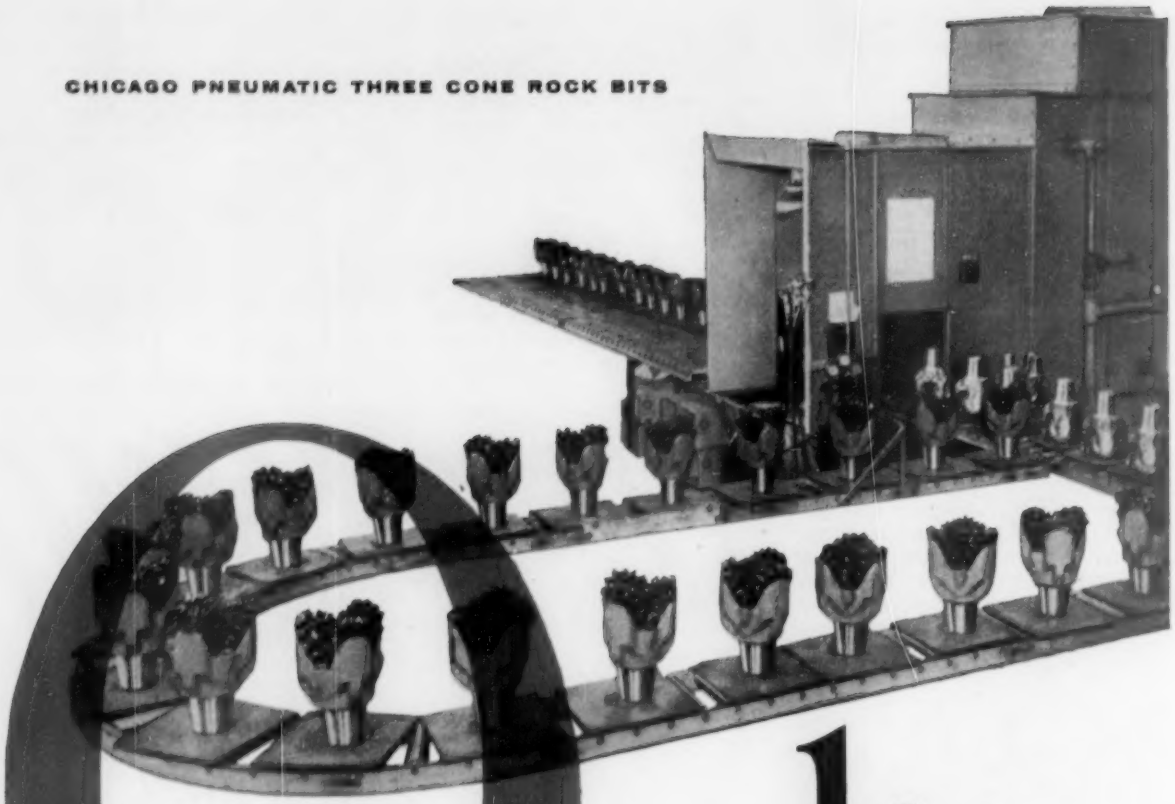
CHICAGO PNEUMATIC THREE CONE ROCK BITS



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CALENDAR

JANUARY

14-16 Pipe Line Contractors Association, ninth annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

14-18 Society of Automotive Engineers, annual meeting, Sheraton-Cadillac and Statler hotels, Detroit.

17-18 Engineers Joint Council, Statler Hotel, New York.

21-25 American Institute of Electrical Engineers, 1957 winter general meeting, Hotel Statler, New York City.

23-24 Northwest Petroleum Association, Nicollet Hotel, Minneapolis.

31-Feb. 1 Annual instrument short course of Southern California Meter Association, Los Angeles Harbor Junior College, Wilmington, Calif.

FEBRUARY

7-8 Western Petroleum Refiners Association, Gulf Coast regional technical-industrial relations meeting, Lamar Hotel, Houston.

8-9 American Society for Testing Materials, Symposium on composition of petroleum, Jung Hotel, New Orleans.

13-15 National Association of Corrosion Engineers, Tulsa section, eighth annual short course for pipeliners, Hotel Mayo, Tulsa.

15-16 National Society of Professional Engineers, spring meeting, Hotel Francis Marion, Charleston, S. C.

22 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

23-25 Instrumentation for the Process Industries, sponsored by Texas A. & M. College, chemical engineering department, College Station, Tex.

24-28 American Institute of Mining, Metallurgical and Petroleum Engineers, annual meeting, Hotels Roosevelt and Jung, New Orleans.

MARCH

3-6 American Institute of Chemical Engineers, regional meeting, the Greenbrier, White Sulphur Springs, W. Va.

6-8 American Petroleum Institute, Southwestern district production division meeting, Statler-Hilton Hotel, Dallas.

8 Ohio Oil and Gas Association, winter meeting, Deshler-Hilton Hotel, Columbus, Ohio.

11-15 American Institute of Chemical Engineers, regional meeting, Philadelphia.

11-15 National Association of Corrosion Engineers, Kiel Auditorium, St. Louis.

12-13 Subsurface Geology Symposium, fifth annual conference, sponsored by the University of Oklahoma, Norman, Okla.

20-22 American Petroleum Institute, southern district production division meeting, Washington-Youree and Captain Shreve Hotels, Shreveport, La.

25-27 Western Petroleum Refiners Association, annual meeting, Hilton Plaza Hotel, San Antonio, Tex.

27-29 American Power Conference, Sherman Hotel, Chicago.

APRIL

1-4 American Association of Petroleum Geologists, national convention, Kiel Auditorium, St. Louis.

2-4 Corrosion Control, fourth annual conference, sponsored by National Association of Corrosion Engineers and the University of Oklahoma College of Engineering, University of Oklahoma, Norman, Okla.

7-10 Petroleum Equipment Suppliers Association, annual convention, Palm Springs, Calif.

7-12 American Chemical Society, national meeting, Miami, Fla.

8-10 American Society of Mechanical Engineers, spring meeting, Dinkler-Tutwiler Hotel, Birmingham, Ala.

9-11 American Welding Society, fifth annual welding show, Convention Hall, Philadelphia.

10-12 American Petroleum Institute, Mid-Continent district production division meeting, Mayo Hotel, Tulsa.

11-13 American Institute of Mining, Metallurgical, and Petroleum Engineers, Pacific Northwest Regional Conference, Portland, Ore.

14-17 Texas Independent Producers and Royalty Owners Association, Galvez and Buccaneer Hotel, Galveston, Tex.

16-18 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

16-18 National Petroleum Association, fifty-fourth semiannual meeting, Cleveland.

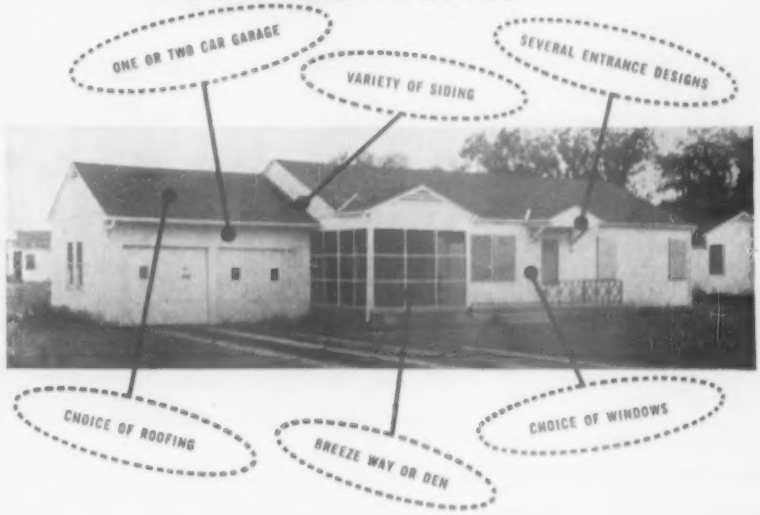
24-26 National Gasoline Association of America, thirty-sixth annual convention, Rice Hotel, Houston.

24-26 American Petroleum Institute, Rocky Mountain district production division meeting, Gladstone, Townsend, and Henning Hotels, Casper, Wyo.

28-30 Independent Petroleum Association of America, midyear meeting, Buena Vista Hotel, Biloxi, Miss.

29-30 Automatic Control in the Petroleum and Chemical Industries, conference sponsored by the University of Oklahoma, extension study center, University of Oklahoma, Norman, Okla.

VARIETY makes individual and attractive STURDYBILT homes



Industrial housing developments need not be made of "look alike" houses. Even when floor plans are the same, exterior appearances can be changed so each STURDYBILT Prefabricated home may have an attractive, individual personality of its own.

Specify STURDYBILT Prefabricated Homes for every field housing need.

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

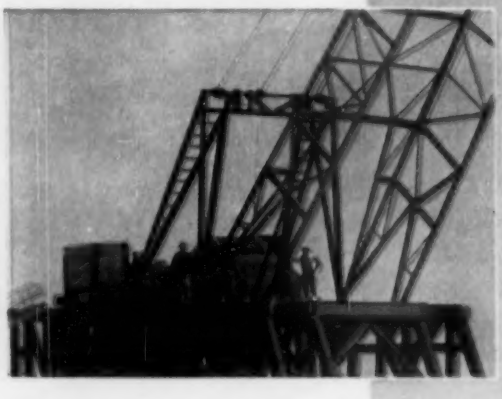
STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS135 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Maximum Portability, Open-Face Design and Ground-Level Assembly Make

EMSCO MASTS

preferred everywhere by experienced drillers

Designed to stand up under hard usage and save time and money for oil well drillers, EMSCO MASTS offer a noteworthy combination of maximum portability, open-face design and ground-level assembly.



Drillers everywhere like the unit design of mast and superstructure which makes assembly on the ground easy and safe. Open-face design makes possible fast operation of various size traveling blocks. Emsco Masts can easily be moved in one piece or nested into sections of roadable widths. Highly suited for barge installation and in oil fields everywhere.

Get all the facts today. Call or see your EMSCO representative.

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The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

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JOURNALLY SPEAKING . . .

The Gold Coast

BEING an Oklahoma country boy, who doesn't get around much among the *haut monde*, we have long suffered from a rather naive embarrassment about the widespread popular conception that all oil men are filthy-rich, lavish-spending, loud-mouthed, ostentatious playboys, and that this is due entirely to the special privilege of the 27½ per cent depletion allowance which is denied the ordinary run of mankind.

We haven't been exposed to much of this fabulous sort of free-spending life in Tulsa, even though this town bills itself as the Oil Capital of the World. We do have some wealthy people here, a nice residential section, some smart shops, a couple of respectable hotels, and a showplace country club—but no night clubs or entertainment spots much above the beer-joint class.

But of course Oklahoma is only the fourth-largest oil-producing state and Tulsa is only the second-largest city in Oklahoma. So we sort of assumed that maybe Tulsa isn't a typical oil town in the sense of high living and throwing money around. We figured that probably Oklahoma oil men are using their 27½ per cent depletion allowance to put money back into their business, to explore for more oil and gas, and to write off the inevitable, inexorable decline in the productivity of their older wells—which is the purpose of this tax provision.

But we almost half believed some of the stories so gleefully carried by the eastern press to the effect that in other oil areas, notably Texas, tax-exempt oil money flows more freely than water, that Houston is the Land of the Sky-Blue Cadillacs, and that hundreds of oil-rich millionaires are hard put to find enough luxurious and spectacular ways of getting rid of their ill-gotten lucre.

But we got our eyes opened to how the other half—the non-oil half—of the world lives when the Interstate Oil Compact Commission met in Miami Beach, Fla.

Miami Beach is certainly not an oil town. Some oil men probably go there for short vacations, but they don't support the place. Yet no city in the oil country can hold a candle to it for ostentatious, arrogant, vulgar display of wealth. Miami Beach is the full-flowered epitome of that aspect of the capitalistic system described by classical economist Thorstein Veblen as "conspicuous consumption." It has 250 luxury hotels, and a luxury hotel is one whose rooms rent for $40 a day and up in season, that charges $1 for a drink of ginger ale and $2.50 for a hamburger, and that has a name band playing in each of its numerous dining and drinking salons.

Everything in the city is on the same scale. The place is jammed with foreign cars, enormous yachts, exotic shops, beach clubs, night clubs, and a jillion other evidences of free spending on a grand and continuous scale. The architects and interior decorators apparently operate on unlimited budgets—and likewise the patrons of the mile after solidly packed mile of these modern-day Taj Mahals. Solomon's Temple in all its glory was not arrayed like one of these.

Florida is the land of palms—outstretched palms—and everyone who visits is expected to dispense largess with abandon and pay seven prices for everything without raising an eyebrow. Yet throughout all this dazzling display of showy luxury that one Texan described as a millionaire's Disneyland, oil men are inconspicuous. The prevailing accents are those of Boston and Brooklyn, not the Southwest.

Obviously oil men are pikers at spending and exhibitionism. There are a lot more rich people in this country than there are oil people. Places like Miami aren't supported by oil money. There must be some other ways of getting rich besides drilling oil wells, some other ways of escaping poverty besides the 27½ per cent depletion allowance.

From now on, whenever we hear anybody sounding off about how the depletion provision is making a privileged class of filthy-rich millionaires we're just going to guffaw. We've seen how the non-oil people suffer in Miami.

—*Henry D. Ralph.*

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Gasoline is a problem for the whole industry

IT'S interesting to see independent producers in Texas and elsewhere becoming very concerned over high gasoline stocks and the condition of the products market in general.

This is welcome evidence of awareness of the interdependence of the various segments of the petroleum industry. All too often in the past, each division has tended to think in a compartment, ignoring the problems of the others.

What the producers want, of course, is an increase in crude prices. And they realize that this will be hard to get and keep if refiners' income continues to be threatened by excessive inventories and weak prices of gasoline.

TOO MUCH GASOLINE is indeed a problem that concerns the entire industry. But some of the solutions suggested by independent crude producers seem naive and impractical.

They include proposals that the U. S. Government use various means to force—and to finance—heavy European purchases of gasoline in this country. Their sponsors are overly impressed with the news stories and pictures of European gasoline rationing, not fully realizing that gasoline is the least essential element of Europe's fuel requirements.

Producers fear that if U. S. refiners meet domestic and export demands for distillates and fuel oil by simply increasing runs, they will pile up a colossal gasoline surplus by spring. This could result in an inventory imbalance and a price debacle injuring the entire industry. Such fears are fully justified.

Refiners ought to be working on this problem now. They shouldn't think in an economic vacuum any more than producers. They have facilities for forecasting demand and price trends.

What's needed is a change in yield pattern to produce less gasoline. Refiners rebel at producers' suggestions that the Government force such a change. But they join with producers in asking the Government to force Europe to take gasoline it doesn't want.

FREE ECONOMICS and individual action are a better solution than any sort of federal interference. There should soon be evidence that these forces are starting to operate.

Demand for distillates and fuel oils is almost certain to get much stronger. This will permit their price to rise—unless the Government intervenes. A small increase in price differentials will provide the money inducement for refiners to shift yields and make less gasoline. And a change of a couple of percentage points in gasoline yields will make a tremendous difference in stock levels by summer.

If these adjustments don't start soon, refiners—and the entire industry—will suffer badly when spring rolls around.

Good Wells Make Good News

Many operators are getting quick payout from Petrojel*. Since Petrojel makes use of the operator's own lease crude (gelled) as the fracturing fluid, treatment costs are low. Payouts have been correspondingly fast. Kerosene or diesel fuel may be used when lease crude is not available. Here are examples from different fields.

- ***Wise County, North Texas***—(New well) Completed in 60-foot, three-zone section of Strawn sand at 4,000 feet. Permeability estimated at 10-15 millidarcys. Swabbed only four barrels of oil per day. Treated with Petrojel using 15,000 gallons of fluid plus F.L.A.* (Fluid Loss Additive) and 15,000 pounds of sand—through tubing in three stages using straddle packers. After 60 days, well tested 80 barrels of oil per day. At 40 barrels of oil per day allowable, treatment cost of $1,455 paid out in 21 producing days.

- ***Colorado County, Texas Gulf Coast***—(Old gas well) Completed in Wilcox sand with perforations from 9,320 to 9,378 feet. Bottom-hole pressure-buildup test on this well indicated that a "skin effect" around the hole was holding potential to 6,900,000 cubic feet per day. The well was given a 250-gallon spearhead of Mud Acid. Then it was treated with Petrojel, using 6,000 gallons of fluid with 9,000 pounds of sand. Two months later, well was producing 13,000,000 cubic feet per day and open flow potential was 72,000,000.

- ***Southeastern Saskatchewan, Canada***—(New well, discovery) Completed in Mississippian Charles. Perforated from 5,983-5,990 feet the well had been acidized twice, yet production was only 40 barrels of oil per day. Dowell fractured through tubing with Petrojel, using 5,000 gallons of gelled diesel fuel and 8,000 pounds of sand. After $1,700 treatment, well tested 90 bopd.

- ***Barber County, Kansas***—(New well, gas) Completed in Mississippian chat of Driftwood pool through perforations from 4,835 to 4,867 feet. After acidizing, well tested 3,500,000 cubic feet per day. Petrojel, using kerosene for quick clean-up, was selected for further stimulation. Treatment used 25,000 gallons fluid with 30,000 pounds of sand and 1,250 pounds fluid loss control agent. Injection rate was 41.4 barrels per minute. After treatment, well potentialed 169,000,000 cubic feet per day.

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The Industry This Week

General Interest

• **Congress takes spotlight** again next week. Oil men can expect natural gas, oil imports, and taxes to be high on the agenda. P. 42.

Petrofina's second small plum is American Liberty Oil. Negotiations have been completed for the U. S. branch of the giant Belgian combine to acquire the integrated Dallas company. It's part of Petrofina's drive to carve out a place in the American market. P. 43.

Exploration

• **Two tests on Colombian concession** totaling 40,000 acres are planned immediately by Houston group. P. 55.

Herbert Hoover, Jr., may take Spanish consulting job. Spain is rumored ready to change its attitude toward foreign capital. P. 54.

First Middle East venture by Germans may be in books. German exploration crews are at work in Syria and may start first well in Northwest Syria within weeks. P. 57.

Sensational thefts of exploration maps hit Gulf Oil's exploration plans in Southwest. Grand jury may reveal missing pieces to puzzle. P. 41.

Refining

• **Philadelphia refining area** will be served by new 500,000-bbl. daily crude line from lower Delaware Bay, where terminal will be built to accommodate deep-draft tankers. Refining capacity in area has now reached 800,000 bbl. daily. P. 47.

Socony Mobil plans expansion programs at four domestic refineries in move to increase its octane potential. P. 53.

First products are flowing from Amoco's new 35,000-bbl. daily refinery at Yorktown, Va., first in the state. Officials last week put the combination crude-distillation and catalytic-cracking unit on stream. P. 51.

Production

• **Second oil boom within 9 months** is building up for Santa Fe Springs, California's 37-year-old graybeard field. A 10,152-ft. discovery may have opened up the tenth producing zone in the field. P. 40.

Fight between majors and independents developed over Texas' January allowable. Railroad Commission asked for pipeline data before deciding whether to increase production. P. 38.

Drilling

• **Highly mobile diesel-electric rig** introduced by Shell may pay for its $375,000 investment in 2½ years on moving savings alone. Shell says rig will save a day per move. It is being put to work in Rockies. P. 44.

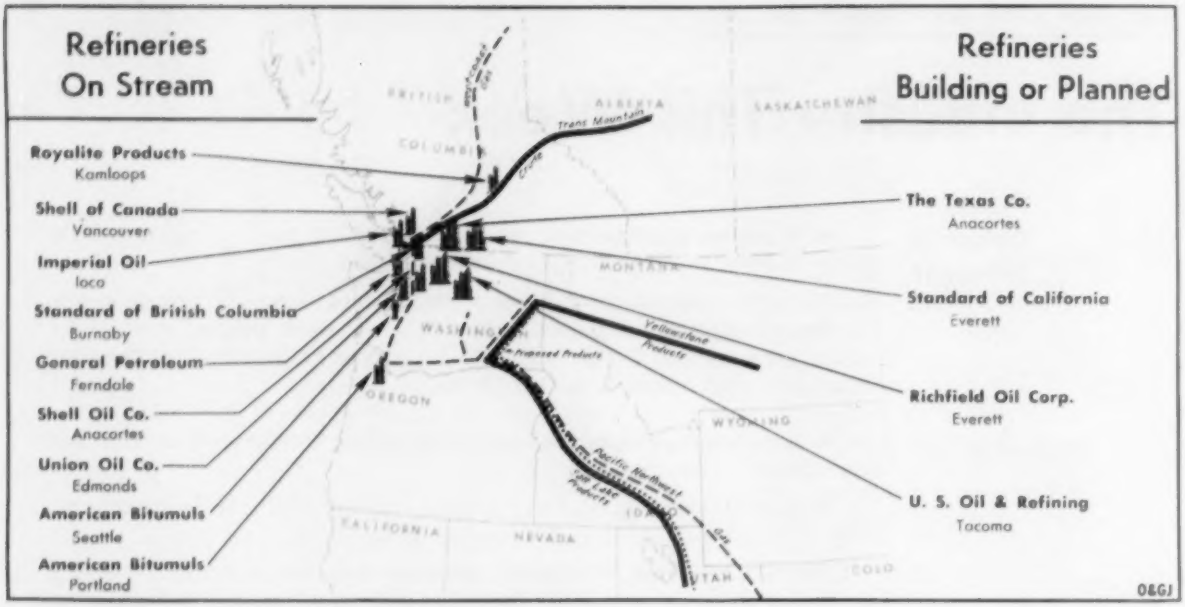
Union Oil's Red Earth discovery in Alberta finally has a confirmation well. The stepout flowed 146 bbl. daily of 38° -gravity oil. P. 37.

Pipelining

• **Four Corners pipeline struggle** may be developing. Plans for crude line to Los Angeles proposed recently are up in air. First official announcement is for a line to be built to move the oil to the Gulf Coast through New Mexico and Texas. P. 35.

South America's biggest gas pipeline will be started early in the year in Venezuela. The 207-mile, 26-in. line will move gas to Caracas. P. 54.

Florida's natural-gas pipeline project may be in trouble. FPC staff report recommends project be turned down. P. 47.



Pacific Northwest Is Mushrooming

- Refining capacity has climbed to 165,000 bbl. per day and will almost double within next 2 years
- Big crude-oil pipeline will carry 240,000 bbl. daily by next summer as production in western Canada increases to nearly 500,000 bbl.
- U. S. and Canadian natural gas will invade market to tune of 1 billion cubic feet daily

FIVE years ago, the Pacific Northwest area was virtually without crude-oil refining capacity, long-distance pipeline facilities, and natural gas.

Today, the rapidly growing region has a refining capacity of more than 165,000 bbl. per day.

Crude-oil, products, and natural-gas lines converge on Washington, Oregon, and British Columbia from such faraway places as the San Juan basin of New Mexico and Colorado and the Peace River area of northern British Columbia and Alberta.

Within the next 2 years, more than 125,000 bbl. of refining capacity will be added. By next fall natural-gas transmission capacity will be increased by 660 million cubic feet per day.

All this activity means that the Pacific Northwest is in the process of making a major adjustment in its traditional energy and fuel supply sources.

Until recently, petroleum products supplied about two-thirds of the region's energy and fuel requirements. Most of this came from California, via tankers, and in the form of refined products.

The balance of the total demand was handled by hydroelectric power, plus a small amount of manufactured gas. This heavy reliance on petroleum was 27 per cent above the national average on a per capita basis.

Natural gas . . . Pacific Northwest Pipeline Corp., which recently agreed on a merger with El Paso Natural Gas Co., is opening the Pudget Sound market to natural gas *(The Oil and Gas Journal, November 12, page 130).*

Its 1,466-mile carrier, stretching from the San Juan basin, was completed this fall, and could deliver up to 343 million cubic feet of gas daily initially.

Natural gas from the Peace River area will be marketed in the Pacific Northwest some time next fall when Westcoast Transmission Co., Ltd., completes its 650-mile big-inch line to Sumas, Wash.

Population growth . . . At first glance, it might appear that petroleum will take a beating from inroads made by natural gas into this heretofore exclusive territory. But a more thorough examination points to a continuing growth for both industries, because of two important factors:

. . . At least 60 per cent of the petroleum-products market in the area is safe from competition with natural gas. The motor-fuel and ship-bunkering markets remain noncompetitive with natural gas. In addition, certain localities are inaccessible insofar as natural gas is concerned.

. . . New industries will be attracted by natural gas, if the price is right. This would bring in more people in an area which has already grown 30 per cent since 1950.

Total petroleum demand is slightly in excess of 300,000 bbl. daily. This represents an increase of about 5 per cent per year in recent years.

This increase will be reduced percentagewise when natural gas enters the picture in full force. But increased population and refining capacity will mean continued growth in demand for both products and crude.

To illustrate the growth in consumption, car registrations in Washington and Oregon jumped more than 350,000 between 1950 and 1955. Use of

Pipelines: **Pacific Northwest Pipeline Corp.'s new gas line from the San Juan basin in Colorado opened the market for natural gas in the Pacific Northwest area for the first time. The 1,466-mile carrier, much of it through rugged terrain, was completed this fall.**

Refineries: **Proximity of Canadian crude oil to the Pacific Northwest has caused refineries like this to spring up in Washington, Oregon, and British Columbia. Shown above is Shell Oil Co.'s 50,000-bbl. plant at Anacortes, Wash., which went on stream last year.**

diesel fuel has increased more than 3,000,000 bbl. yearly in the same 5-year period.

The markets which will be hardest hit by natural-gas inroads are:

. . . The heating-oil business. Last year Washington and Oregon required more than 25,500,000 bbl. of heating oil to meet this demand.

. . . The hydroelectric power industry. This industry will face competition in the home market for water heating and cooking. But, like petroleum, while its ratio to the total demands of the region will be cut, actual consumption will continue to increase as the area's population climbs.

Canada . . . The big oil discoveries in western Canada—sparked by Leduc in 1948—transformed the economy and other aspects of the heretofore comparatively remote provinces of Alberta, Saskatchewan, and eastern British Columbia. Similar effects are now being felt strongly in the Puget Sound area as Canadian output continues to rise. Daily production average is now approaching 500,000 bbl.

As the nearest large-population center, Puget Sound became the natural western outlet for Canadian crude and natural gas, and may become the gateway to other heavily populated areas, such as California.

Replacing California products with Canadian crude in the Pacific Northwest is not affecting California adversely, because of the continuing migration of people to the West Coast.

Refineries . . . The refinery ball started rolling in the Puget Sound vicinity in 1953 and 1954. This growth has seen:

. . . General Petroleum Corp. complete its 37,000-bbl. refinery at Ferndale, Wash., in 1954. It is presently adding another 11,000 bbl. to its capacity (see table). When the refinery went on stream it was processing about half Canadian crude and half California and Venezuela oil. Last winter the plant started using nothing but Canadian crude.

. . . Imperial Oil, Ltd., become the first major refinery in the Pacific Northwest to process Canadian crude only *(The Oil and Gas Journal, December 14, 1953, page 98).* Imperial has expanded its Ioco refinery near Vancouver to a total capacity of 23,000 bbl.

. . . Shell Oil Co.'s Anacortes, Wash., refinery go on stream in late 1955. It processes Alberta crude, and has a capacity of 50,000 bbl.

. . . Shell Oil Co. of Canada, Ltd., double its capacity at Burnaby refinery near Vancouver for a total of 18,000 bbl.

. . . Standard Oil Co. of British Columbia, Ltd., begin operations about 2 years ago at its 18,000-bbl. plant near Vancouver.

Output from these new refineries will be augmented by four installations on the U. S. side of the border, which are either abuilding or in the planning stage. These plans include:

. . . The Texas Co. will construct a 35,000-bbl. refinery near the Shell plant at Anacortes (see table). Construction will begin early in 1957.

. . . Standard Oil Co. of California has acquired a 2,400-acre site at Everett, Wash., for a $65-million plant with an undetermined capacity, ranging from 60,000 to 100,000 bbl. *(The Oil and Gas Journal, December 17, page 92).* Construction will not begin for a year.

. . . U. S. Oil & Refining Co. (formerly Pacific Oil & Refining Co.) is building a 15,000-bbl refinery at Tacoma, Wash., with completion set for May 1957. This will include a 10,000-bbl. combination topping, vacuum and cracking unit; a 2,500-bbl. Houdriformer; and a catalytic polymerization unit.

Last week, contract for construction of the Houdriformer was awarded to Holmes & Narver, Inc., of Los Angeles.

A 1,000,000-bbl. tank farm and docking facilities capable of handling supertankers have already been completed at the site.

. . . Richfield Oil Corp. is negotiating with the Tulalip Indians for a site near Everett, Wash.

Crude pipelines . . . In late 1953, Trans Mountain Oil Pipe Line Co. completed what was generaly conceded to be the toughest major pipeline construction job ever undertaken — the 718-mile crude line across the Rocky Mountains from Edmonton, Alta., to Vancouver *(The Oil and Gas Journal, October 19, 1953, page 76).*

Capacity of the big 24-in. line is 184,000 bbl. daily, but Trans Mountain will increase capacity to 240,000 bbl. by next August, by adding pumping facilities. Long-range plans call for looping most of the pipeline to in-

Refining in the Pacific Northwest

(Capacities in barrels per stream day)

On Stream:

Company and plant location—	Crude oil	Cat. cracking	Cat. refining	Cat. poly.	Asphalt
American Bitumuls & Asphalt Co., Portland, Ore.	6,500	....	....	....	4,200
American Bitumuls & Asphalt Co., Seattle, Wash.	3,500	....	....	....	2,600
General Petroleum Corp., Ferndale, Wash.	*37,000	20,000	6,000	2,000	6,000
Imperial Oil, Ltd., Ioco, B. C.	23,000	7,600	....	1,200	700
Royalite Products, Ltd., Kamloops, B. C.	5,000	1,350	....	100	500
Shell Oil Co. of Canada, Ltd., near Vancouver, B. C.	18,000	7,500	....	400	550
Shell Oil Co., Anacortes, Wash.	50,000	22,000	8,000	3,800	....
Standard Oil of British Columbia, Ltd., Burnaby, B. C.	18,000	7,500	....	900	500
Union Oil Co., Edmonds, Wash.	4,450	....	....	....	....

*General Petroleum is currently expanding capacity to 48,000 bbl.

Building or Planned:

Company and plant location—	Capacity	Status
U. S. Refining Co., Tacoma, Wash.	15,000	Under construction. Completion scheduled May 1957.
The Texas Co., Anacortes, Wash.	35,000	Construction slated to begin in early 1957.
Standard Oil Co. of California, Everett, Wash.	60-100,000	Exact size undetermined. Tentatively slated for completion in 1958.
Richfield Oil Corp., Everett, Wash.	....	Negotiating with Tulalip Indians for site.

crease capacity to 500,000 bbl. per day. Trans Mountain officials said this long-range program would not get under way until 1958.

Earlier this month, Trans Mountain placed a new pump station in operation at Laurel, Wash. This will enable a spur line to General Petroleum's and Shell's refineries at Ferndale and Anacortes to handle the full flow of the main line. Previously the refineries had been supplied by gravity flow.

In addition to supplying Washington and British Columbia refineries, Trans Mountain has loaded more than 40 tankers with Canadian crude at its Vancouver terminal since the first of the year.

Products lines . . . The big crude line and the natural-gas lines are supplemented by two major petroleum product lines:

. . . Yellowstone Pipe Line Co. operates a 30,000-bbl. system from Billings, Mont., to Spokane, Wash. The 540-mile, 10-in. pipeline was completed in 1954.

. . . Salt Lake Pipe Line Co.'s products line from Utah to Spokane, currently averages about 40,000 bbl. daily to the so-called Eastern Empire region of the Pacific Northwest.

Now there is talk of another products pipeline which would follow approximately the same route as the Salt Lake pipeline *(The Oil and Gas Journal, October 29, page 78)*. Looking into the possibility are Standard Oil Co. (Ind.), Phillips Petroleum Co., Sinclair Oil Corp., and Continental Oil Co.

The companies considering the line, or their affiliates, now ship products through the Salt Lake line.

Petrochemistry . . . With natural-gas pipeline capacity of about 1 billion cubic feet daily, the Pacific Northwest may become a "new area" for petrochemistry.

So far, the only natural-gas based petrochemical plant in the Pacific Northwest is Phillips Pacific Chemical Co.'s Coulee ammonia plant near Kennewick, Wash., which has been manufacturing and marketing aqua ammonia fertilizer since last August. Kennewick is in the southeastern part of the state.

The plant, jointly owned by Phillips Petroleum Co. and Pacific Northwest Pipeline Corp., will begin manufacture of anhydrous ammonia for fertilizer and industrial use in February. The unit has a 200-ton daily capacity, and will use natural gas from the Pacific Northwest pipeline as feed stock.

The yearly increase in crude movements, and the advent of natural gas in that area, will undoubtedly mean more and more industry, greater competition for fuel and energy markets, and continued population increase.

Crude-oil movements into the Puget Sound region from western Canada totaled approximately 80,000 bbl. per day in 1955. This is expected to increase to an average of 125,000 bbl. daily in 1956, with the figure increasing each month.

Trans Mountain will transport 155,000 bbl. of crude per day during December, and expects to increase the flow to 175,000 bbl. per day in January.

Oil and gas have made some major strides in the Pacific Northwest in 5 years. Some more big gains are in the making as present plans become reality. But the fast development of this area also closes out an era in the domestic gas industry. The Pacific Northwest was the last major potential U. S. market not served by natural gas.

Gas Case Delayed

Phillips crash postpones West Texas court hearing

AUSTIN.—Phillips Petroleum Co.'s tragic plane crash 2 weeks ago has indefinitely delayed the company's court fight against a Texas Railroad Commission order for the ratable taking of gas from the Puckett field in West Texas.

Killed in the crash were eight Phillips employes, including five executives in the firm's gas department *(The Oil and Gas Journal, December 17, page 98)*.

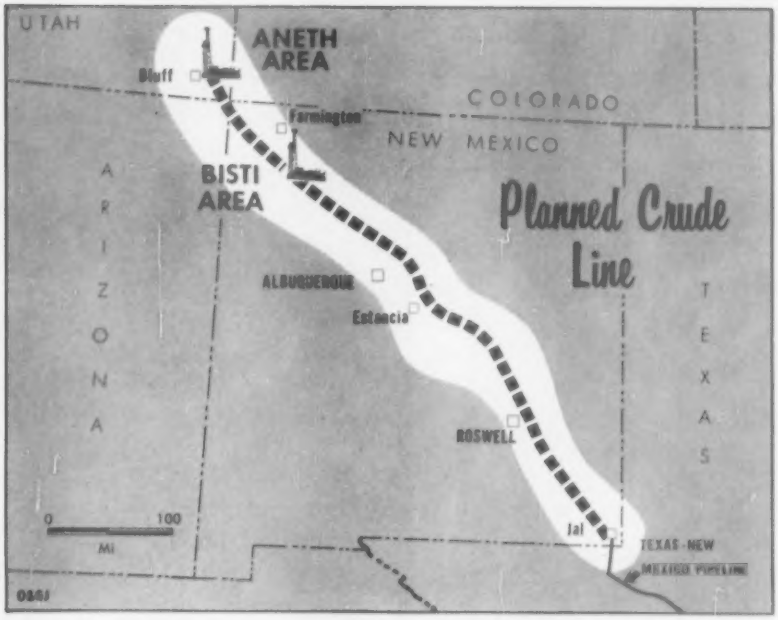
Phillips earlier was successful in its court appeal for a temporary injunction restraining the commission from enforcing the order. The company was scheduled to go into court again December 20 in an attempt to have the order set aside.

A companion suit filed by Permian Basin Pipe Line Co., the gas gatherer in the Puckett field, was still scheduled for December 20. Both Permian and Phillips object to a commission order handed down in November.

What's involved . . . The order held that Atlantic Refining Co., which owns one well in the field, wasn't getting its fair share of the field's demand *(The Oil and Gas Journal, November 12, page 141)*. Phillips owns the remaining 13 wells.

The commission said Permian was a common purchaser in the field and ordered the firm to take 3,800,000 cu. ft. of gas daily from the Atlantic well. It further ordered that Permian must give preference to the Atlantic well, permitting it to overproduce at the expense of Phillips well allowables until Atlantic accrued underproduction of about 467,000,000 cu. ft. was made up.

Permian contends that the commission order makes a "public utility" out of a processing plant built to extract carbon dioxide.



Crude to Flow East

50,000-bbl. outlet for Four Corners area announced by Texas-New Mexico; field work to start early next month

HOUSTON.—Plans for the Four Corners-to-Los Angeles crude line were up in the air last week.

They were put there with the announcement of another line scheduled to move Paradox basin crude in almost the opposite direction. And the supply apparently is not big enough to take care of both projects.

Texas-New Mexico Pipe Line Co. plans to build a 16-in. line to move crude from the bustling area to southeastern New Mexico.

The project, approved last week by the company's board of directors, will provide new fields in the four-state area with their first outlet to Mid-Continent and Gulf Coast refineries.

The new pipeline will extend about 515 miles across New Mexico to tie in with existing systems moving crude north and east.

Texas-New Mexico's plan is a sudden shift from earlier proposals which would have given refineries in California and the Pacific Northwest priority on new crude supplies in the Utah, Colorado, Arizona, and New Mexico area.

The line will have an initial capacity of 50,000 bbl. daily. Additional capacity can be obtained as needed by installation of extra booster stations, the company said.

Field surveys will start immediately after January 1. The company explained that completion date will depend on delivery of the necessary pipe and pumping equipment.

The route . . . Starting in the southeast corner of Utah, the pipeline will cut across a corner of Arizona and through Bisti field in northwestern New Mexico.

From there, it will extend southeastward to Jal, N. M., where it will connect with the Texas-New Mexico system to the Gulf Coast.

In addition to serving new fields in the Four Corners area, the new pipeline will pass through a wide expanse of prospective producing areas between the northwest and southeast corners of New Mexico.

Although most crude lines to the Gulf Coast are now loaded, there is available capacity northward from the Jal area to Oklahoma and Illinois through the Basin and Ozark systems.

Texas-New Mexico Pipe Line Co. is owned by The Texas Co., Sinclair Pipe Line Co., Tidewater Oil Co., and Empire Gas & Fuel Co. (Cities Service Co.).

Competitors' views . . . The company's decision may have an important effect on the Los Angeles line planned by Standard Oil Co. of California and Shell Oil Co. *(The Oil and Gas Journal, October 22, page 74).*

A Shell spokesman said there is no direct connection between the two projects and that nothing will be decided on the California line until after the first of next year. California Standard's only official comment was: "We have the matter under study."

Unofficially, however, a spokesman connected with the California project said the new development appears to make the line to Los Angeles "economically impractical" since Texaco owns the bulk of the reserves in Paradox basin.

The official speculated that Texaco plans to meet future California refinery needs with Sumatra crude and other tanker imports as California production declines.

He also anticipates the competing company's line will bring an uproar from Texas producers since it will move unprorated crude into an area where production is already severely restricted. Price of Four Corners crude is running 25 to 40 cents higher than comparable crude in Texas.

The only apparent justification for the outlet to Texas, the spokesman added, is that Texaco is probably looking ahead 10 to 15 years when crude might be in short supply in Texas.

Defense line . . . Meanwhile, proposals for another line to the West Coast ran aground also. A House armed services subcommittee reported this week there is no evidence that such a line is needed for the defense of the nation.

The project, which would be paid for out of government funds, has been investigated several times in recent years by the subcommittee, which admitted there is a difference of opinion among its members over the possibility of California losing its crude supply in the event of war.

"Individual members," Chairman F. Edward Hebert of Louisiana said, "would feel more comfortable with such a crude pipeline in being. So would the chairman of the joint chiefs of staff and the director of defense mobilization."

The report also showed that a suggestion to stockpile pipe for an emergency line was turned down by the Department of Defense on the ground of lack of military necessity.

Defense officials testified that while the line was not a "military necessity," it would be a "military resource."

Chairman Hebert said his House group will keep close watch on the situation, indicating that major changes in the West Coast picture may result in an about face of committee thinking. No final determination, he said, should be made until the situation clears up.

Since the committee started its inquiry, Southern Pacific Pipe Line Co. has built a line into Los Angeles area for which it was granted quick tax writeoff.

They're up now, but cuts are coming

Why Lower Oil Allowables Really Hurt

John C. Casper
Economics Editor

WHEN the Middle East crisis is settled and U. S. allowables are cut back, domestic producers again will be plagued by an old economic fact:

A producer doesn't prosper just by owning oil in the ground. The economics of his operation just doesn't work that way.

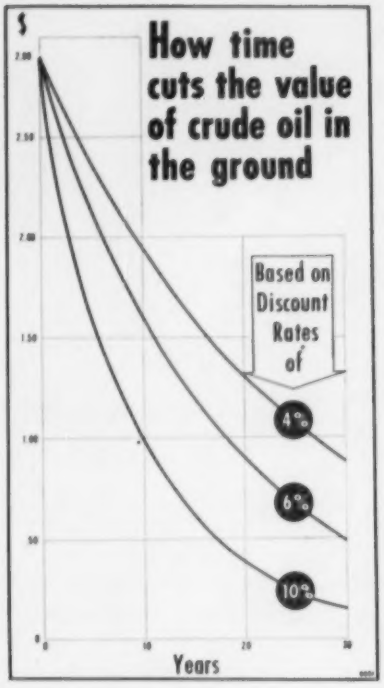
This is contrary to popular belief. The usual reaction when a producer gets a cut in his monthly allowable is: "So what—he can run the oil next month; it's just as valuable in the ground." This idea is even held by some in the oil industry.

But actually, when a producer's allowable is cut, he feels a three-way pinch:

...His profit ratio is cut because many of his costs are fixed.

...His depletion rate takes a drop due to the mechanics of its application.

...His oil in the ground actually drops in value—to him—depending on the bank discount rate prevailing (see chart).



Elusive profits . . . Production cuts hit the oil man's profits because his total expenses do not vary with the amount of crude produced.

In fact, most of the producer's costs do not depend on the daily volume of crude produced. About the only expense item that varies directly with production volume is the energy used in lifting and moving the oil.

Here's an example of how it works.

An operator has a gross income from certain wells for a given month totaling $6,000. Expenses total $2,600. The net before taxes is $3,400. If production is restricted so that gross drops to $4,000, the decrease in expenses will not be proportionate. If total expenses decrease only to $2,400, the net for these wells is down to $1,600. Thus a $2,000 drop in gross means a $1,800 drop in net profit.

Then depletion . . . This decline in profit is compounded by a restriction of the depletion rate, which occurs as profits dip.

Take the case of the $6,000 monthly gross mentioned above. The operator can take the permissible depletion of 27.5 per cent of the gross in this case. This is possible because the deduction of $1,650 is less than $1,700 which is 50 per cent of his $3,400 net. The depletion is limited to 50 per cent of net profit.

But look what happens when the operator's gross drops to $4,000. The 27.5 per cent depletion rate would mean a deduction totaling $1,100. He can't use that, however, because it is greater than 50 per cent of net. So the operator is restricted to a deduction of $800.

What does the operator have left in each case after taxes?

In the first instance, after deducting the depletion allowance, the profit subject to taxes is $1,750. This means a tax of $910 at a 52 per cent rate. So after paying taxes, the operator has $2,490 left.

In the second case, the $1,600 net minus depletion leaves $800 subject to taxes. This means a tax of $416. So after paying taxes, the operator has $1,184.

As the operator's production went down, here's what happened:

...His 27.5 per cent depletion allowance shriveled to 20 per cent.

...His net profits shrunk 52.4 per cent while gross production was going down one-third.

Oil loses value . . . The distressing result to the operator, however, is another fact: The unproduced crude that is left in the ground is losing part of its value.

When an operator says that reduced allowables cost him crude in a particular month, he may be very close to the truth. The common reply is that he didn't lose the crude. The production only was delayed.

It is true the crude still is in the ground. But the value of that crude will be influenced by factors other than the quality of the crude and cost of producing it. These factors are: Length of time before the crude can be produced and the monetary discount rate prevailing.

The crude that could not be produced this month because of reduced allowables or lack of market can not be produced next month. If the wells are in a state where production is prorated, the allowables for next month probably will be about the same as the current month.

But even if the allowable is raised, profitable operation of the field is limited by the maximum efficient rate of production in the field. Thus, the M.E.R. is the limiting factor that determines justifiable production.

The operator can not justify production above the M.E.R. next year even in a state without proration.

In fact, crude that is held back this year, can not be produced until near the end of the productive life of the pool. When will the operator get his money for the crude he left in the ground this year? It will be 5 years, 10 years, 20 years or even longer.

What's it worth . . . Then what is the present value of a barrel of oil that will be produced at the end of 5 years, 10 or even 20?

It's the same amount of money that the operator's banker would give him for a discounted note for the same periods.

The present value of $2.90 a barrel crude based on discount rates of 4 per cent, 6 per cent, or 10 per cent is revealing. At the 10 per cent rate, the present value of a barrel of high-quality crude delivered at the end of 30 years is about 15 cents. Based on a 6 per cent discount rate its value is 50 cents.

With future production worth about 15 cents a barrel, the producer is close to being correct when he writes off as lost the oil he was not permitted to lift this year.

Red Earth Confirmed

Strike extends production 1 mile at Canadian field

CALGARY. — A confirmation well has finally come in at Red Earth field, 220 miles north of Edmonton in northern Alberta.

The new well was completed by Union Oil Co. a mile east of the discovery, which set off one of the biggest land plays in Canadian history last February *(The Oil and Gas Journal, March 12, page 88)*.

The stepout flowed 146 bbl. daily of 38°-gravity crude through a 14/64-in. choke on a 24-hour test. Producing interval is 4,802-16 ft.

A third test 2 miles east of the latest success was nearing completion last week and a fourth location was being prepared a mile north of the original discovery area.

Union holds a 100 per cent interest in about 1½ million acres in the area. Its pool opener came in flowing 792 bbl. daily through a restricted choke in a 2-hour production test. The biggest Granite Wash producer yet, it is generally conceded to be the discovery of the year in Canada.

Peace River . . . Gas operators have been having a field day in Alberta, too. Some 125 miles southwest of Red Earth field in the Peace River, 37 wells have been completed since financial arrangements have been completed for the big pipeline to the region.

The wells have a combined production capacity of 850,000,000 cu. ft. daily. All were completed by Pacific Petroleums, Ltd. Average open flow is 23,000,000 cu. ft. daily. Pacific Petroleums is drilling eight other wells in the area, several of which have indicated good prospects.

Westcoast Transmission Co. is building an outlet from the Peace River area.

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watching WASHINGTON

. . . with Bertram F. Linz

Lengthening shadow . . .

INDUSTRY-GOVERNMENT competition for engineers and scientists has reached a point where Congress has been asked to do something about it.

The shortage of skilled personnel has worried oil and other industries for a long time. But government officials tell Congress that they are even more worried. Their complaint is that not only can the Government not attract the number of people it needs but is losing those it has to private business.

The Defense Department is hurting badly. But Interior is in bad shape, too. It is trying to find 150 technically trained people, including petroleum and chemical engineers, chemists, and physicists.

Higher salaries are the bait which lures engineers out of government service. Interior, for instance, can pay only $4,480 to $8,990 a year. Industry can offer more.

Several ways to remedy the situation have been suggested to Congress. The most obvious, of course, is to increase government salaries. That may be done. But it was also proposed that young men in military service be trained as technicians and engineers.

Persistent plant . . .

THE Government has a stubborn white elephant on its hands in the 60,000-ton alcohol butadiene plant at Louisville.

This last segment of the Government's wartime rubber industry, in which it still has a stake of $6,629,000, just won't come unglued.

The Rubber Disposal Commission couldn't sell the plant in 1955. So it made a short-term lease with Publicker Industries, Inc. It tried again to sell it this year, now subject to that lease. It made a deal with Union Carbide & Carbon Corp. for $3,125,000, which Congress rejected.

When control of the plant passed to the Federal Facilities Corp. when the rubber commission went out of business, it was again offered for lease upon termination of Publicker's contract. Publicker and Union made the only bids, neither acceptable to the FFC.

Now the FFC has abandoned hope of leasing the plant and will ask Congress next year to let it make another try at selling. Recently there has been some interest in its purchase and the agency feels it may have a chance finally of getting rid of it.

New thoughts on oil emerge . . .

THE upheaval in the Middle East is influencing the thinking in a number of places in Washington.

Mobilization planners envisioned the loss of Middle East oil in the event of war. But when it actually occurred, in peacetime and on a limited scale, it showed up some gaps in our domestic setup.

The need to build more tankers was immediately spotlighted. Something probably will be done about that in a matter of weeks. There may be enough vessels to handle the European relief program, but there might not be enough to handle all Europe's needs plus wartime supplies for land and sea forces scattered around the world.

Supplies for Europe also have to be geared to our land transport. Interior officials are making a deep study of pipelines to both the East and West Coasts, as well as inland. A few months ago government agencies didn't feel there was any great need for those lines at this time. Now they are not so sure.

Finally, when Middle East oil again is available the pattern of imports may be greatly changed. The influence of the Government will be directed toward less dependence on distant supply sources. It will call for more reliance on the Western Hemisphere. Above all, it is seen as giving more encouragement for expansion of reserves in this country.

Texas' January Allowable Brings Fight

- **Majors want much higher production; independents argue for no increase in producing days.**

- **Commission, with an eye to high stocks, decides to study more information before reaching a decision**

AUSTIN. — A clash between major companies and independent operators at the Texas crude-oil allowable hearing here last week led the Texas Railroad Commission to delay setting the state allowable for January.

Crude-oil buyers for major companies, hard-pressed to supply enough oil for overseas and East Coast needs, fought for a big increase in January allowables.

Independent operators, representing several associations, opposed any hike in allowable until:

. . . **Unconnected Texas wells**—"now numbering more than 7,700"—get pipeline connections.

. . . **All pipeline-prorated wells** are again producing their full allowables. Independents pointed out that some operators in Howard County still are able to market only 53 per cent of their allowables.

. . . **Crude-oil stocks** in this country come down to levels recommended by the industry.

. . . **Surplus gasoline stocks,** now depressing crude prices, are used up at least in part to help supply Western Europe's petroleum needs.

The commission will not fix the January allowable until it has received and analyzed data from the companies on transport facilities needed to move the oil.

But it did announce that it would not deviate from the state-wide pattern of uniform allowables—which was one of the chief objectives of the independents. A month earlier some purchasers had requested higher producing rates in areas near tanker ports than in West Texas and other areas with limited pipeline capacity. The request was not repeated this time.

A great mass of information was put into the record on demand for crude, stock figures, pipeline rearrangements, availability of crude, and the position of individual companies in supplying the emergency oil needs of Europe. This made it one of the largest and longest allowables hearings in years.

These facts were brought out:

. . . **Crude stocks are not declining** as fast as anticipated, though a number of big companies said their own stocks were close to minimum working levels.

. . . **Pipeline rearrangements** and other means of moving additional crude to tidewater for export will reach their practical limit during January, with little more possible after that.

. . . **Considerably more crude** from West Texas and New Mexico could be moved through Oklahoma via pipelines to the Northeast if barges can be obtained to move it down the Mississippi River.

. . . **Shortage of crude** is being experienced by some buyers, who gave instances of being unable to fill commitments.

. . . **Surplus crude** is available in many parts of Texas, particularly the western and northern areas, where wells have not made their allowables for lack of pipeline connections.

The nominations . . . Of the 13 major buyers submitting nominations, two asked for 16 days in January, which the Railroad Commission estimated would produce about 3,405,000 bbl. per day; 6 asked for 17 days, an increase of about 150,000 bbl. per day; and 5 asked for 18 days, an increase of about 301,000 bbl. per day.

The figures do not include the build-up from new wells nor an estimate of underproduction. Underproduction is now averaging 13.9 per cent below allowables, and there were estimates that it would rise to 15 or 16 per cent at 17 or 18 producing days.

The December allowable is based on 16 producing days, resulting in a current production of about 3,405,000 bbl. per day.

Every nominator stated that it had market commitments and pipeline outlets for the crude it requested, and would purchase ratably across the board from its own connections. However, most of them hedged when asked how far they would go in connecting underproduced wells now without pipeline outlets.

The high nominators hoped to be able to purchase additional crude if allowables are set less than they requested. And the low nominators thought they might be able to sell their surplus if production is above their own needs.

The total of all nominations was for an increase of 141,272 bbl. per day over the December allowables, for a total of 3,225,901 bbl. in January. But at the hearing Humble upped its nominations by 100,000 bbl. per day due to an unexpected inability to meet December export commitments.

The U. S. Bureau of Mines estimates demand for Texas crude at 3,650,000 bbl. per day, compared with its December estimate of 3,130,000.

Stocks still high . . . Stock figures were discussed at length at the hearing. The commission seemed disappointed that they are still high.

Between November 3 (before the Suez closing) and December 8, crude stocks have fallen nationally by 9,214,000 bbl., and now stand at 273,000,000 bbl. In the same period stocks of all Texas origin fell 3,962,000 bbl. and of West Texas origin 2,204,000 bbl.

A month ago the commission got estimates from major companies that the desirable level of crude stocks is between 255,000,000 and 260,000,000 bbl. The commissioners observed that only about half the desired stock reduction has taken place—perhaps a hint that production should not be increased until stocks are lower. But several purchasers forecast that stocks will go down much faster in the next few weeks.

Humble submitted the results of a survey it made to determine the location of these stocks: As of September 30 the national level was 278,791,000 bbl., with 22,658,000 bbl. in PAD District 1; 85,536,000 in District 2; 121,312,000 in District 3; 16,000,000 in District 4; and 32,898,000 in District 5.

Of the September 30 total, 72,749,000 was at refineries, 184,895,000 in pipelines and terminal tank farms, and 21,147,000 in lease tanks.

In 1954 the National Petroleum Council made a stock study and reported that approximately 33 per cent was available, the rest being pipeline fill, tank bottoms, and required working storage. Using the same percentage figure, available crude stocks today would be only 92,000,000 bbl.

Commissioner Murray commented that if the rate of decline between November 3 and December 8 is projected into the future, crude stocks on January 1 will be 267,000,000 bbl., or still above most estimates of the desirable level.

West Texas picture . . . A study of West Texas pipeline capacity, also made by

Humble, was put into the record and showed:

An 18-day producing pattern would yield 1,409,000 bbl. per day in West Texas (exclusive of an area in District 7-C where the crude normally moves north). Add 245,000 bbl. per day from eastern New Mexico and 40,000 bbl. per day of natural-gas liquids moving in the crude stream and the total is 1,654,000. Deducting 158,100 as capacities of local refineries leaves 1,539,900 bbl. per day for pipeline movement.

Pipeline capacity to the south in January will be 1,064,300 bbl. per day. The rest, 471,600 bbl. per day, will have to go northeast. Lines to the northeast are already moving 482,900 bbl. per day from this area, and have 144,000 bbl. per day idle capacity. Between 20,000 and 25,000 bbl. per day of West Texas crude is now being barged down the Mississippi from Wood River, and this may be increased.

The commission requested all major companies to supply detailed information on what they are doing and what more could be done to move oil to tanker docks.

Problems still exist . . . Available crude exists in West Texas, particularly around the Midland region and the areas served by the Cosden and Col-Tex refineries, it was testified.

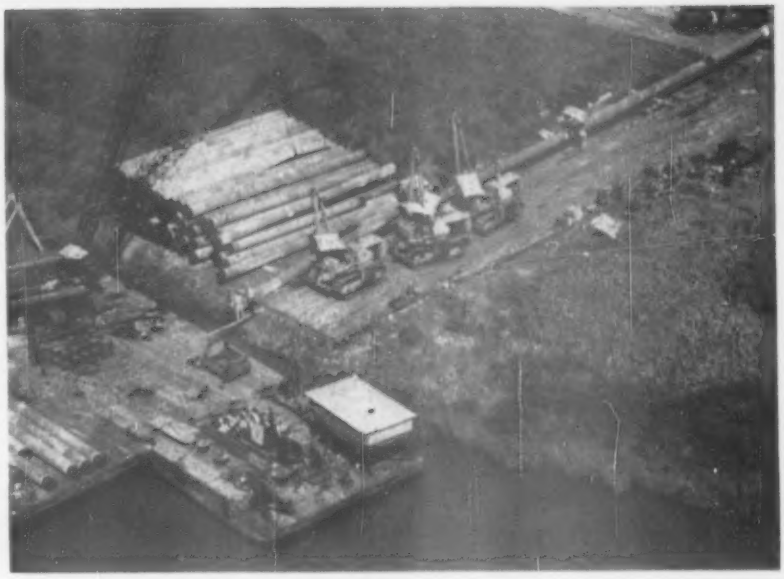
By January these two refineries will be able to lift the pipeline proration they have had in effect for many months, as around 7,000 bbl. per day from 25 or 30 fields will be connected with pipelines to the gulf.

But this is not enough to relieve the entire situation, in the opinion of spokesmen for several associations of independent producers and more than a score of individual producers who testified.

They brought out that there are more than 7,700 wells in Texas not yet connected to pipelines. This forces producers to truck, at their own expense, more than 3,000,000 bbl. per month, and the volume of trucking has been increasing during the year.

What these independents want is to have allowables held to a low, statewide pattern until crude buyers find it expedient to extend gathering lines to unconnected wells and also to expand trunk-line facilities to tidewater from areas now capable of producing more than can be transported.

The strongest statement was a formal petition by the West Central Texas Oil and Gas Association requesting the Railroad Commission to make an investigation of all crude-oil pipelines. It alleged discrimination against independent producers in violation of several Texas statutes.



Side-Boom Tractors shove pipe stalk as . . .

Gas Line Goes Through Swamps

LAKE CHARLES, La.—United Gas Pipe Line Co. has completed the first phase of a construction program which will connect an estimated 375 billion cubic feet of new reserves on the Louisiana Gulf Coast.

The company is laying a 55-mile, 20-in. trunk line and 9 miles of smaller lines to take gas from Deep Lake, Crab Lake, Grand Chenier, Block 4, and Second Lake fields on the coast southeast of Lake Charles.

The 20-in. will connect near Lake Charles with the company's existing system.

Route of the main line at the Deep Lake field end crosses marshes of the Rockefeller Foundation Game Preserve in Cameron Parish.

This watery 5½-mile section of 20-in., plus measuring station, platform, and bulkheads at Deep Lake, was rushed to completion first, prior to the arrival of wintering waterfowl.

Line pipe, yard-coated with 1.1 specific-gravity concrete reinforced with crimped mesh wire, was barged to a construction site near Deep Lake via the network of coastal canals.

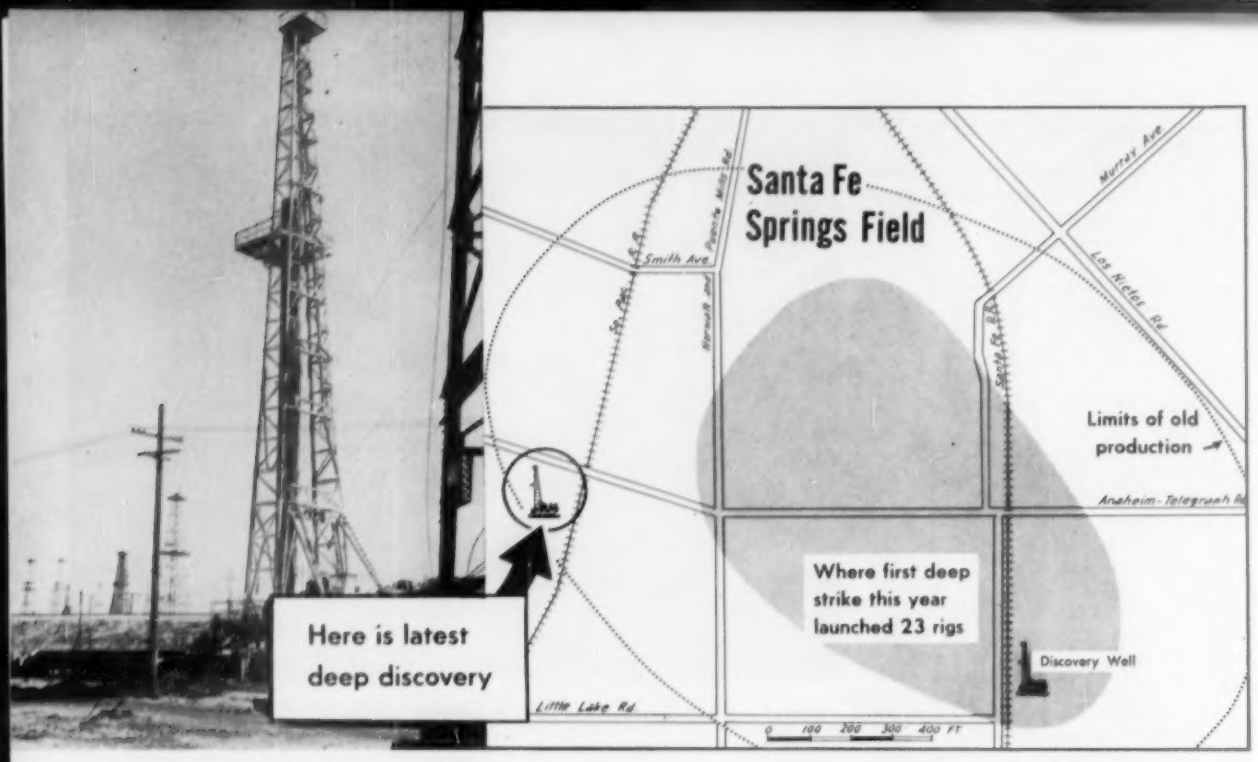
Floating pipe . . . Project contractor, Williams Brothers Co. of Tulsa, erected a two-way shove ramp about 2 miles west of Deep Lake field. Here pipe was welded, field joints coated, and pipe stalks shoved through water-filled drag line ditches to the north and east. Steel drums were strapped to the pipe for buoyancy.

Shoves of about 12,000 ft. to the east and more than 15,000 ft. north were completed from the ramp. Levee and canal obstructions forced an added 2,000-ft. shove to the north.

STEEL DRUMS give pipe buoyancy for sliding along water-filled ditch.

Delivery capacity of the fields tapped by the new line is about 100,000,000 cu. ft. daily. United Gas Pipe Line expects added development and contracts with other producers in the area to hike this volume.

Construction is now under way on the rest of the 20-in., including a dual 20-in. crossing of the Calcasieu River. Contracts for construction of the smaller lines are expected to be let soon.



Fabulous Graybeard On Another Spree

LOS ANGELES.—Once-fading Santa Fe Springs field is acting like a cat with nine lives.

Early this year a king-sized producer opened the ninth distinct pay zone inside the limits of the durable 37-year-old graybeard. Now a second boom in less than 9 months is building up on the heels of still another deep discovery.

The strike which added a rosier tint to the bloom at Santa Fe Springs is 1 SP-Pedro-Nepple, a fault-block discovery on the west edge of the field. It flowed 34°-gravity crude at an initial rate of 720 bbl. daily from 9,443-9,725 ft.

The well, completed by Edward Nepple, went to a total depth of 10,152 ft. It opened the deepest pool yet in the field.

Nepple is already drilling the first offset, about 15 ft. from the discovery well, and it looks like other operators are poised to jump into the play as soon as possible. These include Standard Oil Co. of California, The Texas Co., Shell Oil Co., Tidewater Oil Co., and a number of independents.

Nepple was forced to slant drill the offset since space is at a premium. His lease covers only a thin strip of land and the discovery well is backed up to the Southern Pacific Railroad tracks.

Nepple's new find is more than ½ mile west of General Petroleum Corp.'s prolific strike which came in last February for 1,776 bbl. daily. General Pete's well, the 243 Santa Fe, was the deepest producer in the field until the newest discovery was made.

It is producing 30.9°-gravity crude from the Santa Fe zone at an interval of 8,050-9,010 ft. *(The Oil and Gas Journal, March 5, page 66).* It touched off a drilling spurt which saw as many as 23 rigs sinking hole to the new pay zone at the same time.

The territory in between the two wells includes the most heavily drilled part of the old field. It is studded with wooden and steel derricks left over from two earlier drilling booms which had the field humming with activity back in 1923 and again in 1928.

The box score . . . Whether this year's discoveries will measure up to their illustrious predecessors remains to be seen. They have a big job cut out for them. But if they make the grade, it will be like merging the Mardis Gras and Parade of Roses. An already fabulous production would become even more fabulous.

Santa Fe Springs was discovered in 1919, but not much happened there until 4 years later when the Foix, Bell, and Meyer zones were tapped for such a staggering flow of production that the market was flooded.

At that time, according to a report on the field, Santa Fe Springs alone accounted for one-sixth of the country's total production.

The field, which covered only about 2 sq. miles and has grown little since, was back in the news 5 years later with another spectacular strike which pointed the way to ultimate production of over half a billion barrels.

Upward turn . . . The 1928 discovery was Wilshire Oil Co.'s 1 Buckbee, which went to a new pay zone at 5,860 ft. and came in for 2,000 bbl. daily. It did what operators are hoping the latest discoveries will do.

Production had dropped from 319,989 bbl. to only 37,000 bbl. daily when the well tapped the new pool. A year later, the field's output was back up to 285,000 bbl. daily and production remained at a high level for many years.

But the field has been steadily waning. In 1955, it averaged 12,000 bbl. daily from 575 wells and at the end of the year reserves were down to 50,000,000 bbl. The two latest pool openers have operators in a whirl, however. They are beginning to wonder just how much undiscovered reserves the old field is still hiding.

Santa Fe Springs might never regain its old greatness. But whatever the answer, it's beginning to look good for another 37 years. It may be around with respectable production for twice that long if they just keep punching more holes.

Bizarre Theft Hits Gulf

● Blow to company's southwestern oil-exploration plans could be substantial; grand jury may unravel map puzzle

PITTSBURGH.—Gulf Oil Corp. stands to suffer a substantial loss to its exploration program in the Southwest from a bizarre theft of valuable maps at its headquarters office here.

Gulf officials declined to elaborate on details of the industrial espionage case pending further investigations.

The case broke last week when federal authorities arrested four men in New York. A Pittsburgh federal judge later ordered a grand jury to convene in special session here this Thursday to study indictments.

But Gulf officials admit extent of the company's loss probably never will be known. Nor will it ever be fully determined just how valuable the geological and seismograph surveys proved to those who received them.

A puzzle . . . Oil men hope the grand jury will disclose some missing pieces to the interesting puzzle, by answering these questions:

. . . Whose leasing activity aroused Gulf's suspicions?

. . . Was this activity undertaken on basis of information filched from Gulf's files?

. . . Did Gulf employes know what use was being made of the maps?

How it broke . . . Investigation of the thefts began more than a year ago.

Gulf first started checking when some of its leasing deals in the Southwest suddenly began going sour. Gulf landmen had started trying to acquire leases only to find them already taken by wildcatters. This happened twice within a short time under similar circumstances.

Officials checked the secret map files and found maps for the areas were missing. Further investigation revealed some 30-odd surveys detailing oil prospects possibly worth millions in the Southwest, Canada, and the Middle East were stolen.

Detectives went to work shadowing the few employes who had access to the confidential files. Suspicion was narrowed to one employe. When it was determined the maps had been taken out of the state, the Federal Bureau of Investigation was called in.

Enter racketeers . . . Federal authorities said the Gulf employe stole the maps to pay off gambling debts to New York racketeers.

U. S. District Attorney D. Malcolm Anderson reported the man at first took a few to square his gambling debts. He added that the racketeers realized the immense value of the maps and pressed the employe to steal more.

Anderson said the maps were worth "millions" to Gulf but just how valuable they were to the racketeers is still a question. The FBI has evidence one small portion of the maps was offered for sale at $500,000 and another set of three for $50,000. Neither sale was completed. Most of the maps have been recovered, and an extensive search is being conducted for the missing ones.

How they were used . . . Oil men say the Gulf maps would have been valueless to the ordinary racketeer. They had value only to someone who knew the oil industry, could put the various pieces together, and then read them.

Authorities said the group which got the maps apparently picked up men with oil know-how for they actually set up drilling operations in the Southwest trying to cash in on the Gulf surveys themselves.

The four men arrested were accused of transporting stolen property across state lines. If convicted they could be sentenced to 10-year prison terms and fined $10,000 each. Those being held are:

. . . Odie Richard Seagraves, 60, identified as a well-known Texas oil and natural-gas promoter. He denied any connection with the missing maps.

. . . John Marvin Leivia, 30, identified as a geologist of Orange, Tex.

. . . Edward Lieberman, 30, New York, president of U. S. Tackless Corp., manufacturer of grippers used in laying wall-to-wall carpeting.

. . . Emanuel Lester, 32, New York, listed as Lieberman's brother.

The Rubinstein case . . . Police late in the week suddenly began checking a possible link between the missing maps and the mysterious murder of Serge Rubinstein last January.

Authorities checked whether Rubinstein had a hand in the thefts which occurred over a period of 5 years. Rubinstein, stock manipulator par excellence, was known to have been involved in many oil deals. He was strangled in his Fifth Avenue mansion and his murder was never solved.

Two of the arrested men were connected with Rubinstein, but apparently were his enemies.

FTC hearing set for February:

Gulf-Warren Merger Attack

PITTSBURGH, Pa.—Gulf Oil Corp. is preparing an answer to the Federal Trade Commission's charge that the Gulf Oil-Warren Petroleum Corp. merger violates federal antitrust laws. Hearing is scheduled here February 26.

The FTC said that acquisition of Warren by Gulf last March threatens to create a monopoly in the production and sale of L.P.G. and natural gasoline. Warren was a principal source of supply for independent refiners, dealers, and distributors who compete with Gulf and other major companies.

The only companies with L.P.G. and natural-gasoline output topping Warren are integrated and use most of their production in their own operations. This "captive" production leaves only limited amounts free for other uses. As a result of the merger, the FTC said, independents may be forced to look to competitors for supplies.

Gulf is the fourth largest company in the industry in terms of assets, but Gulf officials pointed out that natural gasoline and L.P.G. are less than 1 per cent of Gulf's business. Over 99 per cent of the firm's business relates to crude and other products.

Warren's assets totaled nearly $164 million against Gulf's $2 billion when the merger took place *(The Oil and Gas Journal, November 14, 1955, page 129).*

The merger raised Gulf from approximately twelfth to fourth place in the production of natural gas. Its reserves of natural-gas liquids increased about 38 per cent to 317 million barrels, making it second largest possessor of such reserves in the U.S., the FTC reported. Gulf has also risen from seventh to first place among sellers of L.P.G. to other producers, as a result of the merger.

The complaint charges that consequently there has been an increase in concentration of production of various oil products in integrated companies.

W. K. Whiteford, president of Gulf, denied the monopoly charges. The two firms are engaged in different types of businesses and have never been competitors, he said.

Whiteford pointed out that the company's lawyers have advised "that the Gulf-Warren arrangement does not violate the Clayton Act or any other antitrust laws, and the corporation expects to uphold this position."

What can oil expect from Congress?

Gas, Imports, Taxes High on Agenda

WASHINGTON. — The curtain will rise next week on what the industry hopes will be the last act in federal regulation of independent gas producers.

But legislation freeing the producers from government control will be only one of a big handful of oil jobs awaiting the new Congress when it meets January 3. Imports, taxes, antitrust, and a number of other issues are expected to be raised before the 1957 session adjourns next summer.

The administration's position on the more outstanding matters may be disclosed in President Eisenhower's annual message a few days after the session opens.

Eisenhower already is on record as favoring the exemption of gas producers from federal regulation. A bill giving distributors protection against escalation "is needed," he said when he vetoed the Harris-Fulbright measure last February 20.

The industry is waiting to see if the President touches on that subject in his message.

Democratic congressional leaders have indicated they will press for a gas bill only if the White House recommends it. They believe that otherwise it would have little change of passage. So the big question is, will Eisenhower plump for legislation in his annual message, state his position later, or ignore the subject entirely?

It will be impossible for Congress to stay entirely clear of the natural-gas problem. Many observers believe it must either pass an exemption bill or give the Federal Power Commission a more clear-cut basis for regulation.

FPC officials themselves have complained of the lack of guideposts in the Natural Gas Act. That law was designed for the regulation of interstate pipelines. It just doesn't fit producers. This has given rise to a score of questions which the FPC has had difficulty in settling.

Fate of the gas bill may be known in a matter of weeks, particularly if the President doesn't ask for it. If the House and Senate commerce committees don't schedule early hearings it will mean that the Democratic leadership has decided to let it die.

What about imports? . . . Second only to natural gas in importance, from the viewpoint of the industry, is the fight over oil imports. Congressmen from the coal states have announced their intention of seeking curbs, particularly on residual fuel oil.

THE PRESIDENT
. . . Oil men are hoping for a signal.

Domestic oil producers will support quota legislation. They see in the current Middle East situation additional reasons why imports should be limited. Their argument will be that the U. S. must guard against getting into a pinch like the one in which Europe finds itself.

The administration has always resisted oil quotas and will have good arguments to support its stand next year.

Mobilization Director Arthur S. Flemming said this month that his decision whether to certify to the President that imports threaten national security has merely been deferred until normal conditions have been restored.

The administration will ask that action by Congress be held up until Middle East oil shipments get back in the groove. This is expected to take a year.

The Middle East situation, aside from imports, also will get congressional attention. There will, of course, be much talk about Europe's oil emergency and the steps taken to relieve it. But definite action may be required if the U. S. subsidizes the purchase of U. S. oil.

Depletion and taxes . . . Taxes probably rank next in industry interest. It is unlikely—again due to the Middle East disturbance in part—that there will be any cut in corporate or individual rates. But the corporation tax may be revised to give relief to small business and there may be a drive for an additional $100 exemption for individuals.

The depletion allowance, however, is of more importance than the tax rates. The 27½ per cent rate for oil and gas has been under fire from some quarters for several years. It may come under new attack if Congress studies any general tax legislation.

Treasury Secretary Humphrey has said the depletion allowance is a necessary incentive to expanded exploration and development. But the department has never committed itself on the rate it thinks proper. The House ways and means committee may try to smoke out that information this winter.

There are a good half-dozen other measures affecting the industry that are sure to be brought up during the coming session, too.

Synthetic liquid fuels . . . Sen. Joseph C. O'Mahoney of Wyoming is expected to push for a big new research program on oil shale. He will have the support of the Navy Department, which now holds the experimental plant at Rifle, Colo. The plant formerly was operated by the Interior Department.

Congressmen from the coal states are expected to get back of a similar program for coal. A House interior subcommittee was set up last session to study the field of new uses for coal by research programs on synthetic oils, chemicals, and other products.

The Agriculture Department earlier this year threw cold water on suggestions for a big "crash" program to find new uses for surplus farm crops. But Sen. Homer E. Capehart of Indiana will again press for a $100,000,000 research project which would include studies in producing cheap alcohol to be blended with automotive gasoline.

Lands . . . Last session's investigation of military "land grabs" may lead to efforts to write a law limiting the withdrawal of public and Continental Shelf lands by the Defense Department. The department, by agreement with the House interior committee, has held up plans to take over some 30,000,000 acres in the Gulf of Mexico for training purposes, but has not dropped them permanently.

The Navy's attempt to get money to test San Nicolas Island as a possible

naval petroleum reserve is likely to come up again. The department may ask for a clear-cut policy on the setting up of new reserves which it claims Congress and the National Security Council ordered it to find.

Divorcement . . . Rep. James Roosevelt of California is still dissatisfied with the relations between major companies and their retailers. The latter are expected to push for divorcement of marketing from other branches of the industry.

Roosevelt will support it, but the bill is not seen as too likely to pass. It may result in a new all-out study of the oil industry by the Federal Trade Commission, however. The FTC has been eying such a study for some time, but Congress has balked at spending $750,000 or more on it.

A bill against price discrimination is expected to get more support than divorcement, unless the administration opposes it strongly. Roosevelt heads a subcommittee which plans early hearings on the entire subject.

There also may be a move for a new study of concentration in major industries, including oil. This would be patterned after the work of the Temporary National Economic Committee in 1938-39. That study, headed by O'Mahoney, resulted in a 61-volume report in which the oil industry showed up somewhat favorably.

Leasing . . . The leasing law may be amended to stiffen control of acreage limitations on federal lands.

A congressional committee looked into leasing in the Southwest last summer. It heard suggestions that the maximum acreage be increased, as well as recommendations that it be reduced. It came back with an idea that the limitations aren't always enforced vigorously.

Sen. Clinton Anderson of New Mexica is expected to be back of any bill that may be written to sharpen the teeth of the control provisions.

Monopoly . . . There will be considerable activity in this field during the session. The two big targets are the good-faith defense against charges of price discrimination and mergers.

The good-faith issue is pending in the U. S. Supreme Court, for the second time, on an appeal by the Government. This is the well-worked-over Standard Oil Co. (Ind.) "Detroit" case. The high court tossed out the FTC's first order and the Chicago federal Court of Appeals this year threw out its "revised" order.

The Supreme Court may act on the case before Congress gets around to it. If the court holds fast to its original position, the drive to overrule it will be stepped up.

A bill to require that mergers of corporations with combined assets over $10,000,000 give the Government advance notice of their plans is gaining support at the capitol. The Justice Department and FTC are back of the bill, and the former has been actively plugging it in speeches by officials.

Lobbying . . . If the investigation of lobbying, set off by the Case "incident" while the natural gas bill was before the Senate, leads to any concrete results, they will be outlined in a report to be written by the Senate special committee which made the probe.

But if industry is attacked, oil will not stand alone. The committee has found that other industries and interests have also worked hard for and against laws affecting them.

All of these matters call for studies by congressional committees. But there are likely to be some general investigations in addition.

The House commerce committee, which used to make biennial studies of the oil situation, for example, hasn't run such an inquiry for several years and may decide it is time to bring its information up to date.

Petrofina Spreads Again

● American Liberty Oil of Dallas second small integrated firm acquired in Belgian giant's invasion of U. S. market

NEW YORK.—American Petrofina, Inc., gave another splash last week indicating it is growing into a bigger fish in the U. S. oil pond. It completed negotiations for acquiring its second small American oil concern.

Latest addition to holdings of the American branch of the giant Belgian oil group will be American Liberty Oil Co., Dallas. Negotiations on the deal were wrapped up last week. Only writing and signing a formal contract remain. Price of the transaction was not revealed.

Earlier American Petrofina had acquired Panhandle Oil Corp., also of Dallas, as its first step in becoming a fully integrated American oil concern *(The Oil and Gas Journal, September 10, page 88)*. American Liberty holdings are similar and in the same southwestern area as those of Panhandle.

Where it stands . . . The American Liberty Oil deal now gives American Petrofina this hand to play in the U. S. oil game:

. . . Two refineries with combined capacity of 23,000 bbl. daily.

. . . Crude production ranging from 7,500 to 8,000 bbl. daily.

. . . Retail outlets numbering 500 in North Texas and South Oklahoma.

. . . Aggregate assets of $90 million.

This is only the start of American Petrofina's campaign. It aims to spread over the entire United States. The fact that marketing territories acquired through Panhandle and American Liberty lie in the Southwest is no indication American Petrofina will stay put there.

Latest deal . . . Facilities of American Liberty are small but fit admirably with American Petrofina's Panhandle holdings. They include:

. . . Refinery at Mount Pleasant, Tex. This 16,000-bbl.-daily plant is equipped for catalytic cracking capacity of 9,000 bbl. daily, polymerization, and asphalt units. The Panhandle refinery at Wichita Falls acquired earlier is rated at 7,000-bbl.-daily capacity. It also is equipped for catalytic cracking.

. . . Crude production ranging from 3,500 to 4,000 bbl. daily. This is about the same amount of production acquired in the Panhandle deal.

. . . Reserves of 15,000,000 bbl. of oil which also is approximately the reserves bought from Panhandle. Oil properties are located in Delhi field, Louisiana, and in West Texas and Gulf Coast fields.

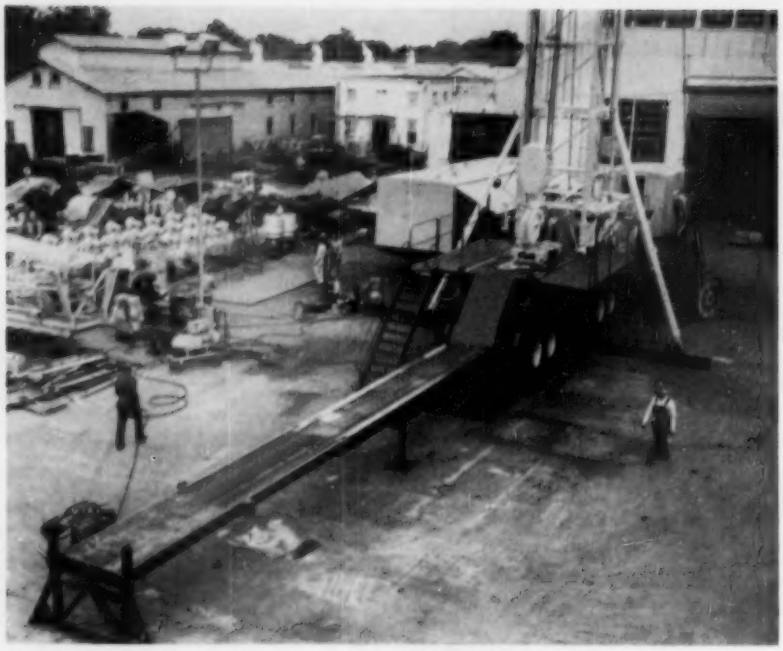
. . . Retail outlets numbering 250. All of these are in Northeast Texas.

American Liberty also owns an affiliated pipeline company. It has 142 miles of 4 and 6-in. crude lines and 17 pump stations.

The future . . . Petrofina plans to operate the acquired companies as divisions of the parent concern under their established names.

This means it may be some time yet before the company's already well-known international brand "Fina" is adopted in the States.

One aspect of the two companies now in the Petrofina fold is the similarity of their holdings and marketing territories. The western part of the American Liberty territory and eastern section of Panhandle's area overlap.



New Rig Is Big Hit

First trailer-mounted diesel electric is hardy specimen and it's adding an extra month of drilling to the year

STERLING, Colo.—Shell Oil Co. apparently has come up with a winner in its portable diesel-electric rig.

The highly mobile unit, an industry first, cost Shell about $375,000. The company thinks it will pay for itself in 2½ years. One big reason: It is so flexible it will save a day per move, the company says, and the rig it replaces averaged 30 moves a year.

Shell has the unit on first test at Dune Ridge field, southeast of here in the Denver basin. It is scheduled to go to the J sand at about 4,500 ft. The rig is rated at 7,000 ft. with 4½-in. pipe and 10,000 ft. with 3½-in. pipe.

Some other advantages claimed by Shell are higher efficiency and lowered maintenance costs. It is more portable than conventional models, requires less time to set up, and reportedly develops fewer mechanical ailments.

Key to the rig's flexibility is the trailer-mounted diesel-electric power plant, which contains six diesel engines. It can be located any place on the drilling site and, through flexible cables, can operate draw works or mud pumps in a matter of minutes.

Two other trailers speed rigging time, too. One contains the draw works and doghouse. The other supports the 105-ft. telescoping mast, substructure, and rotary table. The two trailers are pinned together to form a rigid, compact drilling unit, with drilling platform, catwalks, and substructure.

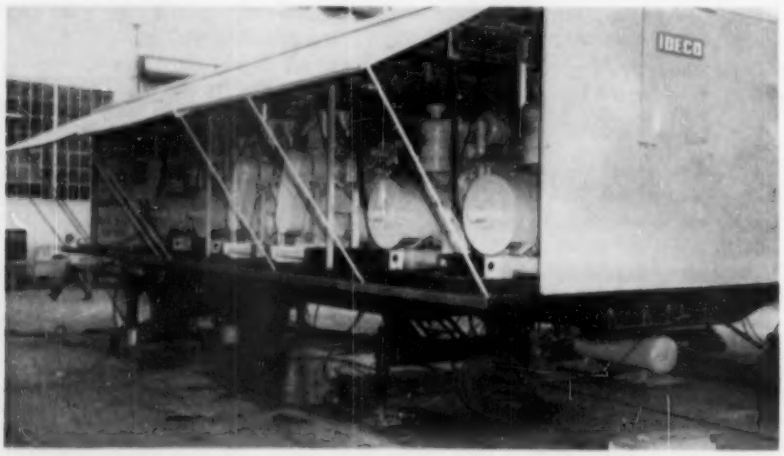
The only part of the unit not mounted are the mud pumps. They are unitized on a skid with electric drive and transported on a flat-bed truck. The pumps can be installed at any one of several locations.

More power . . . The diesel-electric rig develops 750 to 800 hp., compared with 550 to 600 hp. turned up by conventional equipment of similar size. The drive mechanism is simpler and more compact, giving the outfit an efficiency rating of 80 per cent or better. Conventional units usually rate about 60 to 70 per cent in this category.

The new rig does not require a constant power source with the driller regulating speed by use of gears. Instead, it varies the speed of the draw works by regulating the diesel engines supplying power to the draw-works motor. The driller can regulate the power with switches on the drilling platform.

Power plants are four Caterpillar D337 diesels and two Cat D318 diesels. Power for drilling and hoisting is provided by the four bigger engines, rated at 180 hp. each. They drive General Electric d.c. generators. The two smaller engines drive a.c. generators for rig auxiliaries.

The rig was built by Ideco Division of Dresser Industries and purchased through Jones & Laughlin Steel Corp.



HEART OF FAST-STEPPING and versatile rig is this battery of power plants, four skid-mounted Caterpillar D337 (Series F) diesel engines and two Cat D318s. Trailer is 37 ft. long and 10 ft. wide with catwalks folded.

Infringement Suit Filed

LOS ANGELES.—A Long Beach inventor charged Superior Oil Co. with illegal use of his oil well stringer hanger in a patent infringement suit filed here last week.

C. R. Dale alleged that Superior asked for drawings of his device to study before possible use on wells in the Superior operated Rio Bravo field unit in Kern County. Instead of contracting for the stringer hangers from Dale, Superior allegedly started making and installing its own, Dale's suit charged. The inventor asked for an injunction against further infringement and damages for misappropriation of his device.

A stringer hanger is used in flowing wells to permit production through tubing from either the top or the bottom of the zone.

San Pedro Terminal stores Natural Gasoline . . . in Hortonspheroids . . .

Two 141½-ft. diam. Hortonspheroids at the Warren Petroleum Corporation San Pedro terminal.

Natural gasoline, at the Warren Petroleum Corporation's San Pedro, Cal., terminal, is stored in the two 141½-ft. diam. Hortonspheroids® shown above, to prevent excessive evaporation loss. The structures, designed for 15 lbs. per sq. in. working pressure will allow no loss to occur as long as the internal pressure does not exceed the pressure relief valve settings.

CB&I builds Hortonspheroids in standard capacities to 120,000 bbls. and in the smaller capacities for pressure to 100 lbs. per sq. in. Our nearest office will be happy to supply further information.

Office of the terminal with the Hortonspheroids in the background.

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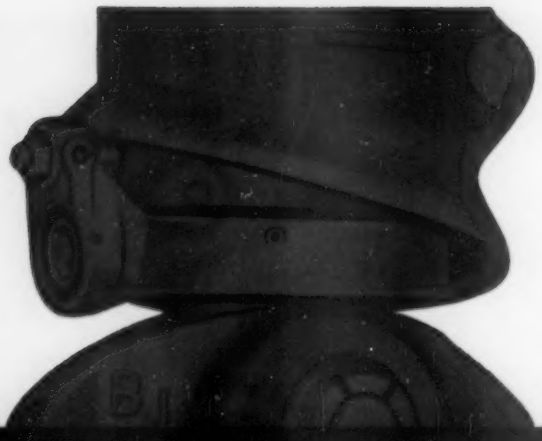
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

When you make your derrick man reach out and wrestle the elevator with every stand of pipe, you are wasting drilling time and money . . . and sacrificing safety.

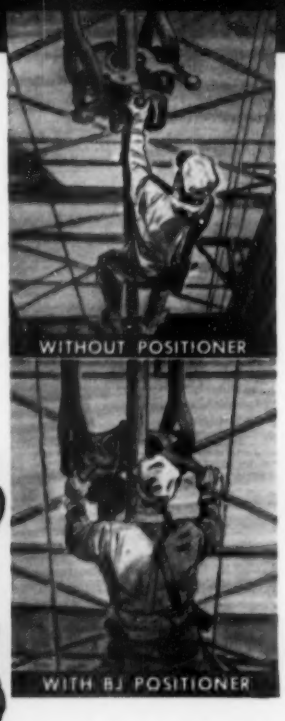


If you don't have a Hook Positioner you're sacrificing Time, Money and Safety!

Here's where Byron Jackson's *exclusive* hook feature pays off. The BJ Hook Positioner automatically rotates the elevator into the correct position for the derrick man. Elevator handles and door are ready for instant, easy latch-on. There's no groping, grabbing and griping.

The BJ positioner consists of a cam follower which travels on a hardened cam track. The cam follower may be set and locked in any of 24 regular positions. Whenever the load is released from the hook, the cam follower travels upward until it contacts the cam surface on the housing. It then automatically travels on the cam surface and rotates the hook body to the predetermined position. This accurately locates the elevator door handles so that the derrick man can quickly, easily and safely latch-on the next stand.

Don't make a monkey out of your derrick man. Make your next hook a BJ Hook with *exclusive hook positioner*. You'll save money . . . with safety!



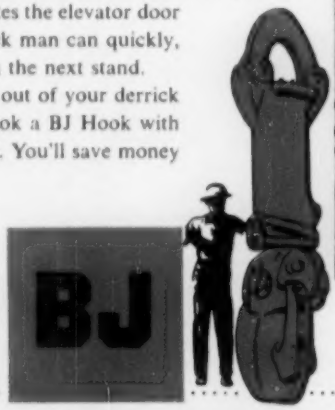
Here's How It Works!

Elevator at monkey board has door handles perfectly positioned for derrick man to load stand.

Going in hole, conditions such as crooked hole, bridges, etc. rotate hook body and elevator.

At rig floor, slips take load and BJ Positioner automatically rotates hook body to pre-set position.

Elevator is fully re-positioned into correct working position—for elevator opening at floor and for instant latch-on at board.



Watch BJ Red for the Newest

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Huge East Coast Line Planned

PHILADELPHIA.—A 500,000-bbl.-daily crude pipeline will be built from a point on the lower Delaware Bay to the Philadelphia refining area.

The project will be built by Cape Pipe Line Co., organized by Sun Oil Co., Cities Service Co., and Atlantic Refining Co. interests. W. C. Kinsolving, president of Sun Pipe Line Co., said it would be ready in 1960.

A terminal will be built in water deeper than 50 ft. at its mean low mark to accommodate deep-draft tankers which will unload into a submarine line. The pipeline and deep-water terminal were decided on because of difficulty in getting supertankers all the way to Philadelphia, which has a refining capacity of 800,000 bbl. daily. The alternative would be a costly dredging operation.

Other companies operating in the Delaware Bay area, including The Texas Co., Tidewater Oil Co., Socony Mobil Co., Sinclair Oil Corp., and Gulf Oil Corp., will be invited to participate in the project. In addition other interests which want to joint will be given an invitation.

Diameter of the line, and the exact mileage, were not specified in the first disclosure of the project.

New steel program depends on . . .

Vital Answers Due This Week

WASHINGTON. — Two decisions vital to the oil industry will be made by Mobilization Director Arthur S. Flemming this week.

They will show whether the Government will allocate plate steel for tankers and whether a new program, supported by quick tax write-offs, will be opened for expansion of plate, structural steel, and oil-country tubular goods.

Final talks on the subject were held by Flemming last week with the Defense Mobilization Board and other groups.

While Flemming has not disclosed how he leans on the questions of plate allocation and steel expansion, there are two factors which observers believe will strongly influence his decisions:

There is not enough plate available, apparently, to keep present tanker-building on schedule. There definitely is not enough to take care of the increased requirements for additional planned tanker construction.

Additional plate supply can be secured only by building more plant. A substantial expansion of exploration and development operations can be had only if there is an assured supply of tubular goods.

Basis for decision . . . Flemming's decisions will be based in part on the report on tanker construction through 1961, submitted last week by the National Petroleum Council, and in part on a new estimate by the Defense Department of its material requirements in the fiscal year which begins next July 1.

N.P.C.'s report said the world tanker fleet will increase more than 50 per cent during the next 5 years and that nearly 29,000,000 tons of new capacity is now building or firmly planned. This is two-thirds of the present tonnage.

The report corresponds closely with figures compiled by John I. Jacobs & Co., Ltd., of London, and the Shipbuilders Council of America *(The Oil and Gas Journal, December 10, page 88).*

The administration's proposed tanker program will be taken up after the issues of plate allocation and steel expansion are settled. Flemming is expected to meet with cabinet members and industry representatives immediately after the turn of the year.

Westcoast Completes Stretch

VANCOUVER, B. C.—Seventy per cent of Westcoast Transmission Co., Ltd.'s 650-mile gas line in western Canada was completed last week before winter closed down most of the operations.

Dutton-Williams Brothers, Ltd., finaled a 120-mile stretch across the summit of the Rocky Mountains at Pine Pass, bringing the total to 455 miles.

Although most work is closing down for the winter, construction will continue on river crossings, aerial bridges, compressor stations, and gas scrubbing plant jobs. Contractors with work still to do are Canadian Bechtel, Ltd., R. A. Conyes Construction Co., and Mannix, Ltd.

When the 30-in. carrier is completed next fall, it will bring natural gas to the U. S. and Canadian Pacific Northwest from the Peace River area of northeastern British Columbia and northwestern Alberta (see related story on page 32).

New Line Opposed

FPC staff asks turndown for Florida gas project

WASHINGTON.—Fate of the $148-million Florida pipeline teetered in the balance last week as the Federal Power Commission pondered a staff recommendation that the project be turned down.

The staff objections were laid before the full commission in oral arguments December 21. Arguments were on applications of Houston Texas Oil & Gas Corp. and Coastal Transmission Corp. to build the two segments of the line which would serve Florida with gas from the Rio Grande Valley.

Counsel for the companies urged approval of the application. The FPC, by short-circuiting its normal procedure, is trying to reach a decision by December 31. A number of contracts for gas supply to the line will be revoked if the line does not have a green light by that date.

Objections . . . The FPC staff brief, signed by Oscar E. Reed, staff counsel, presented a number of objections to financial and contractual set up for the new system.

Its brief attacked:

. . . Supply figures presented at the examiner's hearing. The staff claimed the line will not be able to meet peak-day requirements without overloading and packing.

. . . Contract provisions for cancellation as unsatisfactory.

. . . Rate schedules which do not meet FPC requirements.

. . . Financial arrangements, including equalization of the rate of return and the common-stock equity.

Record Crude Unit Planned

BEAUMONT, Tex.—A 100,000-bbl. crude distillation unit with the world's largest lubricant distillate capacity will be built at the Beaumont, Tex., plant of Magnolia Petroleum Co. Construction will start next spring. On-stream target date is the middle of 1958.

Magnolia expects the modern new still to yield exceptionally high-quality lube and other distillates and to result in large operating and maintenance savings. It will turn out unfinished butanes, gasolines, naphtha, kerosine, gas oils, lubricants, and residuum.

The unit will eventually replace seven smaller ones, but will not mean much of a boost in capacity. Throughput at the plant will reach 205,000 bbl. daily by early next year. Foster Wheeler Corp. of New York will build the unit.

DeGolyer: An Oil Legend

● Death ends fabulous career of world's No. 1 geologist; his life is a story of perfecting new ways to find oil

IN the summer of 1906, a University of Oklahoma freshman hired out as cook for a United States Geological Survey field party headed for Wyoming.

From this humble start stemmed an exploration career that has become a legend in the oil industry.

The freshman proved no great shakes as a cook. But his imagination and quick grasp of geology favorably impressed C. Willard Hayes, then chief geologist for the USGS. Hayes later was instrumental in giving the youngster a boost on his career.

The young man was Everette Lee DeGolyer. He was born October 9, 1886, in a sod hut near Greensburg, Kans. His parents were homesteaders who moved later to southwestern Missouri. Here, while attending high school at Joplin, young DeGolyer watched his father prospect for lead and zinc—and some of the prospecting lure rubbed off on the boy.

That was the beginning of a career which saw DeGolyer:

. . . Discover a huge oil pool in Mexico before he graduated from college.

. . . Found and operate Amerada Petroleum Corp.

. . . Pioneer use of geophysics in hunting oil in the U.S.

. . . Become the world's leading oil consultant.

Down to Mexico . . . DeGolyer got the Wyoming cook's job through E. G. Woodruff, who with Charles N. Gould was one of his professors at Oklahoma.

He continued to work summers with the survey until 1908 when he left the university to work for the newly organized Oklahoma Geological Survey.

This was followed by jobs with the USGS in Washington and in Colorado. But in the autumn of 1909, DeGolyer was offered a job as a field geologist in Mexico. The offer came from Willard Hayes, who had left the USGS to become chief geologist for Mexican Eagle Oil Co., Ltd.

Mexican Eagle was controlled by Sir Weetman Pearson, head of a great English contracting firm. Pearson was inspired by Anthony Lucas' Spindletop discovery. He leased thousands of acres in Mexico, found oil, and built pipelines and refineries. The fields, however, had been of low caliber and short lived.

Pearson hired Hayes to take over the exploration effort, and Hayes in turn brought in DeGolyer as one of his staff.

EVERETTE LEE DeGOLYER
. . . one man honored before death.

First big success . . . DeGolyer first located the discovery well for the mediocre Tierra Amarilla field.

Then he supervised completion of 1 Potrero del Llano, the discovery well of a field located by G. Jeffreys. But on December 27, 1910 came his first big success. The 4 Potrero del Llano came in gushing 110,000 bbl. of oil daily from 1,911 ft.

DeGolyer went back to O.U. in 1911 for his degree in geology and at the same time acquired a wife, Nell Goodrich, his German teacher. The couple had five children, all but one still living.

He returned to Mexican Eagle briefly as chief geologist and helped stake location for discovery well of the spectacular Los Naranjos field. But in 1914 he left again to set up a consulting practice in Norman, Okla.

Trail-blazer . . . DeGolyer and Pearson again crossed paths in 1918, and big things began to happen.

Pearson called him to London—this time to help sell the old Mexican Eagle outfit to the Shell combine. DeGolyer returned to the United States the next year to organize an American oil-producing company for Pearson.

They called the firm Amerada Petroleum Corp. with DeGolyer as vice president and general manager. He later served as president and chairman of the board. Amerada over the years grew into a large and respected independent oil concern.

DeGolyer made news in 1922. He successfully directed the first geophysical survey of an oil field in the United States. The event capped a long and intense interest DeGolyer held in the origin of salt domes and their importance to oil.

His first project was a torsion-balance survey of Spindletop field, a technique which he introduced into this country. The next year DeGolyer introduced the refraction seismic method of geophysical exploration. This proved a disappointment, however, until L. P. Garrett of Gulf Production Co. invented the "fan shooting" method.

In May of 1925, DeGolyer organized Geophysical Research Corp. as a subsidiary of Amerada and headed the company himself. The company built an electrical recording seismograph. It used the transmission of the shot instant by radio and sound waves for determining distance. Within a few months this practice became standard for all oil companies. Under his direction Geophysical Research also initiated and developed the reflection seismograph and introduced the modern magnetometer into the United States.

Again on his own . . . DeGolyer resigned as board chairman of Amerada in October 1932. He wanted to go on his own again.

Soon after leaving Amerada, he helped organize Geophysical Service, Inc., a pioneer in this field. DeGolyer in 1936 formed another concern. Together with Lewis M. MacNaughton and John Murrell, he organized DeGolyer & MacNaughton, an oil-properties appraising concern which became world famous.

The phenomenal energy of DeGolyer in the next decade was applied in many directions.

He put in service with the Interstate Oil Compact Commission. During the war years, he filled a variety of important government posts in Washington dealing with oil and later with atomic energy. Only last year he was the prime mover in organizing Isotopes, Inc., a new company dedicated to applying radioactive isotopes to industrial uses.

But early last week, Everette Lee DeGolyer died in Dallas 2 months after his 70th birthday. In his time he had become the petroleum industry's No. 1 geologist.

Many honors . . . DeGolyer was one man whose achievements were honored

before his death. His significant awards would fill a small book.

Besides a host of honorary degrees and memberships, the honors include: The Texas Mid-Continent's Distinguished Service Award in 1939; the Anthony F. Lucas Medal of the A.I.M.E. in 1941; the John Fritz Medal of the Founder Societies in 1942; and the A.A.P.G.'s Sidney Powers Memorial Award in 1950.

DeGolyer had wide intellectual interests beyond his geological, geophysical, and scientific studies relating to the oil industry. He was an authority on the historical and geographical literature of the Southwest and of the Spanish influence on this region.

California's Oil Conservation Row Spreads Offshore

SACRAMENTO. — California's recently defeated oil and gas conservation proposal just won't stay dead.

Col. Rufus Putnam, executive head of the State Lands Commission, last week stirred embers of the old fight. He suggested to an assembly investigating committee that unitization features of the rejected proposal be incorporated in the Cunningham-Shell Act.

The compulsory unitization features of the bill were the core of the November election battle *(The Oil and Gas Journal, October 1, page 60)*. They called for compulsory unitization of a field when 75 per cent of the surface-area owners agreed.

Putnam argued that compulsory unitization might serve the state's best interests in offshore leases. The Cunningham-Shell Act opened up most of California's potentially oil-rich tidelands to exploration and development. Prior to its passage in 1955 only those state tidelands being drained by offsetting production were opened.

The State Lands Commission, as previously predicted *(The Oil and Gas Journal, December 10, page 104)*, also asked the assembly to review royalty provisions of the state's offshore leases. The commission recommended that a 12½ per cent flat royalty rate on leases classified as wildcats be amended to include escalator provisions.

This suggestion brought protests from the oil industry. Typical was the comment of Robert T. Patton of the Western Oil and Gas Association. He said: "The proposal would strike down the very incentive the legislature put in the law to encourage oil companies to find out where the oil is."

Processing briefs

The 3-week-old strike at Pure Oil Co.'s 45,000-bbl. Lemont, Ill., refinery ended last week. Workers returned after both the management and the Oil, Chemical, and Atomic Workers Union local accepted a reworded 1-year contract. Wages were not an issue in the strike negotiations. Principal factors in the dispute were overtime, leaves of absence, no-strike and no-lockout clauses, and safety provisions.

Dow Chemical Co. has started clearing site for construction of a multimillion-dollar plant near Baton Rouge to produce basic and intermediate chemicals.

The plant, to be erected on the west bank of the Mississippi River 10 miles south of Baton Rouge, will include caustic soda and chlorine units plus several organic-chemical units. Cost of the development has been estimated at more than $50,000,000.

First production is scheduled for the spring of 1958, with all units due to be completed during the first half of that year.

Humble Oil & Refining Co. has announced plans for a major expansion in the petrochemical field. The company soon will start construction of a large ethylene recovery plant at its Baytown, Tex., refinery.

Using a low-temperature fractionation process, the unit will recover more than 80,000,000 lb. of high-purity ethylene per year from refinery gases. The unit is scheduled for completion about mid-1958. Ethylene produced at the new plant will be sold in the Gulf Coast area and will be transported by pipeline.

Also scheduled for construction at the Baytown refinery in 1957 are a fluid catalytic cracking unit and associated ends units.

Directors of Standard Oil Co. (Ohio) have authorized construction of a $40,000,000 refinery at Toledo. Construction will begin in early April. Completion is set for mid-April, 1958.

The project will comprise essentially a new refinery. The existing plant, rated at 28,000 bbl. per day, will be supplanted by the new units, except for a 5,900-bbl. per day alkylation unit and some other processing and auxiliary facilities.

The right of nine independent oil companies to oppose the move to sell the stock of the Universal Oil Products, ruled by Supreme Court Justice Jacob Marktowitz, has been upheld by the Appellate Division.

The independents based their claim on the grounds that Universal is the only company in its field providing consulting and research services on a nondiscriminatory basis. This, they contend, enabled them to compete with large companies. Otherwise, they say, they would be forced out of business.

Shell Oil Co. has contracted to sell Piedmont Airlines a kerosine-type turbine fuel to power 12 new turboprop Fairchild F 27's scheduled to go into operation in 1958. The sale calls for 9,000,000 gal. per year for 3 years.

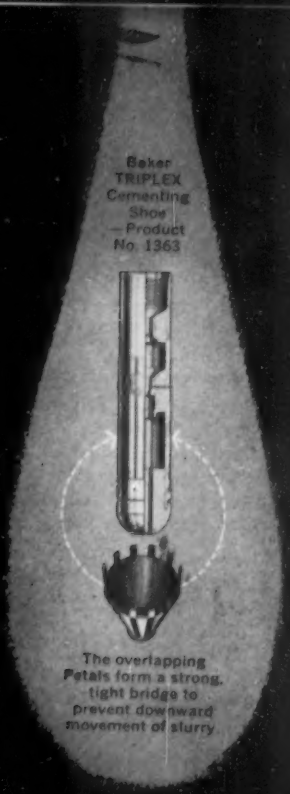
The product is called Shell 640 turbine fuel, which corresponds closely to the British D.E.R.D. 2482 specifications. It is also similar to the JP-1, with a specific gravity range of 42°-50° and a freezing point of —40° F. The fuel falls within most of the specifications which have been drawn up for tentative standardization under the A.S.T.M. as "Turbine Fuel A."

Also for Refiners . . .

Refining capacity of the Pacific Northwest area will top 300,000-bbl. daily within the next 2 years . . . Plans now in the mill call for expanding at least one of the nine present refineries and building four new ones (P. 32) . . . American Petrofina is closing negotiations with American Liberty of Dallas that include purchase of American Liberty's 16,000-bbl. refinery at Mount Pleasant, Tex. (P. 43) . . . A 500,000-bbl. crude line will be built from Delaware Bay to the Philadelphia refining area . . . The big line will be constructed by Cape Pipe Line Co., a firm organized by Sun, Cities Service, and Atlantic Refining (P. 47) . . . Magnolia will build a 100,000-bbl. distillation unit at Beaumont (P. 47) . . . Amoco's new Yorktown, Va., refinery turned out its first barrel of gasoline last week (P. 51) . . . Socony Mobil will build up its octane pool with reforming additions at four refineries (P. 53).

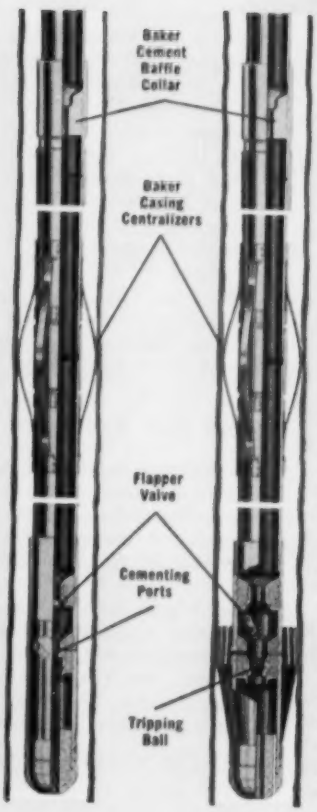
PLUS THESE TECHNICAL FEATURES: How oil volatility and additives affect octane requirements of engines (P. 69) . . . Two-way radio system at Indiana Standard's Whiting refinery is cutting costs, providing flexibility, mobility, and covering a wide area (P. 75) . . . On the Job . . . In the Plants (P. 79) . . . Cost-imating (P. 81) . . . and the Foreman's Page (P. 84).

Protect permeable low pressure zones with the BAKER TRIPLEX cementing shoe...



Cementing casing at a predetermined point above bottom, and at the same time protecting a lower, permeable zone from cement contamination always has been a difficult problem. Such work is now a routine operation with a Baker TRIPLEX Cementing Shoe.

A special float shoe is combined with a Baker Metal Petal Basket that expands to form a bridge and retain cement slurry **above** the Basket, even in large-diameter or irregularly shaped holes. The TRIPLEX Shoe, with its flapper-type back-pressure valve, operates as a conventional **float** shoe while landing the casing and conditioning the hole. When cementing is done and pump pressure is stopped, the valve closes and cement is **held in place behind the casing until it sets.**



Baker Casing Centralizers are installed on (and above) the shoe joint, thus providing a uniform annulus to receive the slurry. While running-in, a Hold-Down Strap (secured by shear screws) retains the Basket against the TRIPLEX Shoe, and the cementing ports are covered by the Tripping Valve. After reaching the desired point, a Tripping Ball is dropped to seat upon the Tripping Valve. Pressure is applied to shear the screws, force the Tripping Valve downward, and expose the cementing ports. This action releases the Hold-Down Strap and the Basket expands against the walls of the hole. When cementing starts, the slurry is directed upward by Baker "Whirling" Action, and retained **above** the shoe by the Metal Petal Basket.

BAKER OIL TOOLS, INC., HOUSTON • LOS ANGELES • NEW YORK

First return on $35 million as . . .

Amoco Refinery Put On Stream

YORKTOWN, Va. — American Oil Co. got the first barrel of gasoline last week from its new 35,000-bbl. daily refinery here. The $35-million plant is the first in Virginia.

Plant officials paused briefly in their work of putting units on stream to celebrate the first barrel of products. Shown gathered around the barrel in the photograph are Frank C. Bunker, unit man; Guy L. Honeycutt, operating superintendent; Mark C. Hopkins, refinery manager; and Brady V. Tunnell, assistant manager.

The men had just put on stream a combination crude-distillation and catalytic-cracking unit. The combination consisted of a two-stage crude distillation unit and an Orthoflow catalytic-cracking unit. The latter has capacity of 30,600 bbl. daily including 30 per cent recycle. Polymerization and treating facilities also are incorporated.

Next unit to be installed at the plant will be a delayed coker. It will charge 9,600 bbl. daily and is scheduled to produce 600 tons daily. On-stream date has been set in January. Final unit will be a 7,600-bbl. daily Ultraforming unit due for completion next March.

The Yorktown plant will process Tia Juana, Venezuela, crude. Terminal facilities on the York River will accommodate the largest tankers, but the river channel will limit vessels to 45,000 deadweight tons.

Producers Line to Expand

KANSAS CITY.—Great Lakes Pipe Line Co. plans to start construction this spring on two extensions of its products system.

The project includes:

. . . An 84-mile, 8-in. line from its existing line south of St. Paul eastward to Eau Claire, Wis., which is not served by pipeline at this time. It will be up to shippers to build terminals.

. . . A 68-mile, 12-in. line into Chicago from the intersection of the Great Lakes system with Badger Pipe Line. This will give Great Lakes additional capacity into Chicago, to which it is now connected with a 6-in. line laid in 1931.

Actual starting dates will depend on pipe delivery. Bids on the construction contract will be received sometime after the first of the year.

The two lines are part of a $15-million expansion of the 5,000-mile system which moves products from the Tulsa area northward.

—— *Industry* briefs

Dow Chemical Co. has purchased about 60,000 acres of land in South Louisiana for potential oil and gas exploration. The land, mostly in Iberville, St. Martin, Assumption, and Iberia parishes, was acquired through purchase of Schwing Lumber & Shingle Co. Management of the properties is being turned over to Dow's Brazos Oil & Gas Co. division.

Operations were suspended by Petroleum Exploration Service Co., after a $280,000-fire destroyed the firm's offices in the White Building, Abilene, Tex. The loss included a $25,000 technical library, laboratory equipment, maps, records, and files. Owner Dan Kralis, consulting geologist, reports that the loss is not covered by insurance.

Standard Oil Co. of California has purchased an undivided one-half interest in 42,746 acres of oil and gas leases in San Juan County, Utah, 20 miles northwest of Aneth field. Acreage was sold by Four Corners Uranium Corp. and Out West Uranium & Oil Co., both of Denver, for an initial cash payment of more than $500,000.

Standard will drill first well on the acreage early in 1957 without cost to other two firms. They will participate in future wells with costs to be paid from production.

The Pennsylvania Legislature will be presented a comprehensive oil and gas conservation bill during its 1957 session.

The state has never had such a law, and in the opinion of Gov. George M. Leader it is not particularly needed in the old stripper fields now under water flood. But it is needed to avoid waste in the recently discovered gas fields, he thinks, and is expected to stimulate deep exploration. Leader says the bill will be modeled after the Interstate Oil Compact Commission's suggested statute with the advice of industry representatives.

Western Development Co. has contracted to purchase the assets of the Resler Oil Co. of Artesia, N. M., for $2,000,000, according to W. E. Scorah, Western president. The acquisition covers about 39,150 acres of proved and nonproved areas in the Artesia and Loco Hills fields, Eddy County, New Mexico. It adds an estimated 2,700,000 bbl. to Western's reserves.

An artist's pencil shows how 100,000-ton giant dwarfs T-2 tanker. It means . . .

. . . New Tanker World's Biggest Vessel

NEW YORK.—Supertankers are getting more super all the time. Latest champion in the heavyweight class will be a 100,000-ton vessel to be built by Bethlehem Steel Co. for Victory Carriers, Inc.

Here's what the big ship means:

. . . **Crude-carrying capacity** of 825,000 bbl. equal to substantially more than the normal daily average production of Louisiana, third ranking oil-producing state.

. . . **Gasoline-carrying capacity** sufficient to supply 50,000 passenger cars for a year.

. . . **A cost to build** of about $27 million. This is 80 per cent of the cost of a new refinery being built by American Oil Co. in Yorktown, Va.

. . . **Cargo valued** at $1,625,000 if it carries Saudi Arabian crude. It will be able to make seven round trips per year.

. . . **Cruising radius** of 26,000 miles without refueling. This would enable it to sail around the world at the equator.

CONSTRUCTION DEAL for world's largest tanker was completed by these men at Grace National Bank of New York. Seated, left to right, are Clarence G. Morse, chairman of Federal Maritime Board; Capt. Granville Conway, president of Victory Carriers; and D. D. Strohmeier, vice president of Bethlehem Steel Co.'s Shipbuilding Division. Looking on are A. S. Onassis and Ralph S. Stillman, president of Grace National Bank.

Big contract . . . The agreement calling for the 100,000-ton vessel totaled $55 million. It included two other tankers of 46,000 tons each.

The contract is believed the largest civilian ship-construction contract.

All three ships will be built in the Quincy, Mass., yard of Bethlehem, the only yard in the country large enough to accommodate a ship of this size.

Three-fourths of the stock of Victory Carriers is controlled by Grace National Bank as trustees for the children of A. S. Onassis. The company is headed by Capt. Granville Conway.

The vessels are expected to operate in the Persian Gulf-U. S. service and will sail under the American flag. Under agreement with the U. S. Government, Victory Carriers and other Onassis companies will be permitted to transfer older tonnage to foreign-flag service.

How it sizes up . . . The supertanker, when fully loaded, will displace more than any other ship including naval vessels.

The vessel will be 940 ft. in length and have a beam of 132 ft. This will

make it somewhat shorter than the Queen Elizabeth at 1,031 ft. or the United States at 990 ft. But it will be much wider than these two passenger liners which are 119 and 101.5 ft. wide.

Plans call for the ship to make the Persian-U. S. East Coast run loaded via the Cape of Good Hope and empty through the Suez Canal. At 17 knots the round trip will require about 50 days. On this basis the ship can transport 5,775,000 bbl. of oil annually.

Spending brisk . . . Two other companies—Gulf and Caltex—in year-end reports revealed they are spending more than $100 million each on new tankers in 1956.

Caltex announced it had ordered or received 15 tankers totaling 485,100 tons this year, the greatest ship-building year in the company's history. Caltex, with its 90 companies operating in 67 Eastern Hemisphere countries, will have more than 100 ships in its fleet with completion of the new orders.

Ships ordered by Caltex include three of 18,000 tons; eight of 32,000 tons; one of 39,100; two of 45,000; and one of 46,000. The two 45,000-ton vessels will be built in Belgium, the largest ever built there.

Gulf's program encompasses 10 new ships and "jumboizing" of nine war-built tankers. Its total ship-building program in the U. S. for the year will cost $113,384,000, the largest peacetime expenditure in Gulf's history.

The 10 tankers are to be built by Bethlehem. They include six of 29,250 tons and four of 32,600 tons. The fully loaded capacity of the smaller ships is 254,000 bbl. and the larger 270,000 bbl. The jumbo program calls for replacing the midship section on the T-2 tankers to increase capacity from 141,000 bbl. to 175,000 bbl.

The Maritime Administration has given Gulf permission to transfer eight 16,800-ton T-2's to foreign-flag operations. Gulf has considerable foreign-flag tanker tonnage and is building a number of ships abroad in addition to the U. S. construction.

Five new refining units mean . . .

. . . Higher Octane for Socony

NEW YORK.—Socony Mobil Oil Co.'s new program to increase motor-fuel quality will put that company in the forefront on octane potential.

Socony will have catalytic reforming in all but one of its eight refineries, and alkylation facilities in all but two, when the following new building program is completed:

. . . Sulfuric acid alkylation units at the Buffalo, N. Y., and Trenton, Mich., refineries.

M. W. Kellogg Co. has the contract to build the 2,435-bbl. unit at Buffalo, and Fluor Corp. will build the 3,500-bbl. unit for the firm at Trenton.

. . . A 9,000-bbl. catalytic reforming unit at Augusta, Kans. Contract was awarded to J. F. Pritchard & Co. of Kansas City.

This will be the second unit of this type for Augusta. The first one, employing a platinum-type catalyst in a fixed bed, was placed on stream in early 1955.

. . . Two units at Casper, Wyo. Pritchard has contracts for a 3,000-bbl. reformer and a 3,250-bbl. catalytic hydrodesulfurizer. The latter unit will treat heating oil and other distillate fuels. The reformer will include a pretreater to desulfurize reformer feed stock.

The catalytic reformers will be the type which Socony originally termed "Sovaforming." Although the company no longer refers to this name, it is generally used for fixed-bed and platinum catalyst type units being built within the Socony family, including General Petroleum Corp., and Magnolia Petroleum Co.

The same is true of the Sovafining name, originally given to Socony's catalytic hydrodesulfurization process used internally.

The effects . . . Completion of the new units will brink Socony refineries—not including the General Petroleum and Magnolia affiliates—to a total catalytic reforming capacity of 76,000 bbl. per stream day. This will represent about 25 per cent of crude capacity in Socony's eight refineries.

The two new alkylation units will swell Socony's high-octane component capacity from 9,100 to 15,035 bbl. per stream day, representing about 5 per cent of crude capacity. The company recently completed 61,000-bbl. per day in catalytic reforming capacity and 2,900-bbl. per day in alkylation capacity.

The new units just announced are being designed by Socony Mobil engineers.

Socony's big higher-octane building program got into full swing in 1954, and will continue through 1958 *(The Oil and Gas Journal, August 16, 1954, page 91, and March 19, 1956, page 118).*

New Sooner Strike

Sinclair helps fill in gap at western Oklahoma wildcat

TULSA.—Sinclair Oil & Gas Co. has indicated production in Dewey County, Oklahoma—one of the few remaining nonproducing counties in the western part of the state.

The discovery is the No. 1 Kunc, rank wildcat southwest of Taloga. It flowed 25 bbl. of 49°-gravity oil in 10 hours on ½-in. choke with 1,411 M.c.f. of gas daily. Production is from Cherokee-Pennsylvanian lime, perforated at 9,159-93 and 9,201-13 ft.

After acid treatment the test flowed 67 bbl. of oil with 153 bbl. of load and acid water in 24 hours on 9/64-in. choke. Gas volume on 20/64-in. choke was 2,800 M.c.f. per day.

Just 3 weeks ago at one of Oklahoma's most important discoveries of the year, another nonproducing county in western Oklahoma joined the producing ranks. Union Oil Co. of California found gas-distillate production in Woodward County at the 1 McCormick. Woodward is just north of Dewey County.

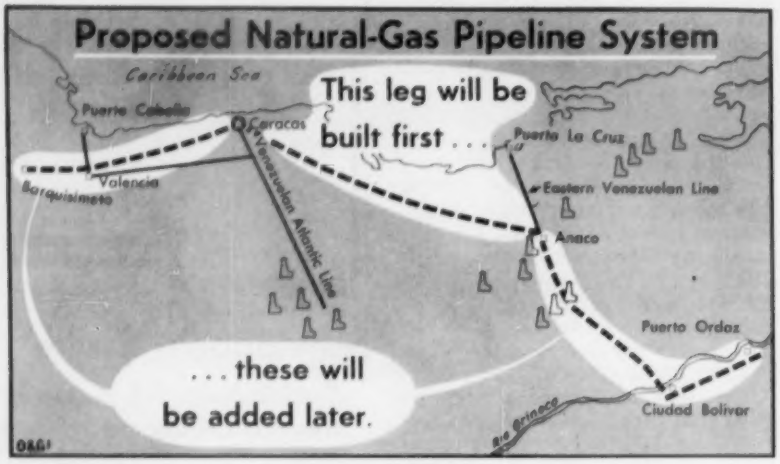
Only remaining nonproducing counties in western Oklahoma are Roger Mills, Custer, Blaine, and Harmon. All but the latter adjoin Dewey County.

Loading Rules Relaxed

The U. S. Coast Guard has waived loading regulations on coastwise tankers to release additional tonnage for the European run.

Waivers were requested by the Defense Department in the interest of national defense. It permits tankers on the Gulf-East Coast run to load to greater depths than normally allowed in winter.

Officials estimated roughly that one tanker will be released to carry oil to Europe for every 25 coastwise vessels permitted to overload.



Venezuelan Line Planned

● Government's plans to step up industrial expansion will get a big boost when new project is completed

SOUTH AMERICA'S biggest natural-gas pipeline project is scheduled to get under way shortly after the first of the year in Venezuela.

Petrogas, S.A., a Venezuelan engineering and construction firm, will build the 207-mile, 26-in. line from Anaco fields to Caracas for the government, plus a distribution system in Caracas. Fulghum Contracting Corp., Harrisburg, Pa., will be consultants on the line, which will have capacity of 200,000,000 cu. ft. per day. Estimated cost of the main line is $21,450,000. The distribution system will add approximately $4,950,000 to the project.

Right-of-way and other preliminary work have already begun. Some construction equipment has been shipped to Venezuela. Actual pipe laying will not begin before spring or summer, however. Two spreads will be used, and completion will take 18 months to 2 years.

Natural-gas system . . . The Anaco-Caracas line is part of a projected government system which will be extended some 63 miles westward from Caracas to Guacara, near Valencia (see map), and later on west to Barquisimeto.

From Anaco, it will be taken to Ciudad Bolivar and Puerto Ordaz, the center of the Venezuelan steel industry on the Orinoco River.

The principal line in Venezuela's present system is the 195-mile, 10, 12, and 16-in. line of Venezuelan Atlantic Transmission Co., built in 1952 by Williams Brothers for Atlantic Refining Co. It serves Caracas, Maracay, and Valencia. This and other planned natural-gas lines will bring the fuel to more domestic consumers and will spur the government's program of industrial expansion.

A 25-mile line from Guacara to Moron, near Puerto Cabello, was built recently by Petrogas with Williams Brothers as consultants. This line will serve a petrochemical plant at Moron which will be completed next year. It will produce 150,000 tons of fertilizer per year, plus chlorine, caustic soda, and explosives and fuses for mining. The government also plans a 3,000-bbl.-daily refinery at Moron in its first venture into the refining business.

The country's other principal gas line, Eastern Venezuelan Gas Transport Co. (Creole, International, Mene Grande, and Shell), runs some 60 miles from Anaco to Puerto La Cruz on the Caribbean coast.

Shell line . . . Cia. Shell de Venezuela is building a 177-mile, 20-in. gas line from La Paz fields, in the Maracaibo district, to its refinery at Cardon.

Brown & Root, Houston, has the contract for the gulf and lake crossings. Contracts have not been awarded on the overland part of the line. Bids will be called for next month.

Natural gas will fire refinery furnaces, freeing more fuel oil for export.

Oil Fever in Spain

Hoover may help Madrid in drive for oil production

SPAIN apparently is about to abandon its longtime arms-length attitude toward foreign capital—especially foreign oil capital.

Reports from Madrid indicate the Spanish Government is weighing changes in its laws governing participation of foreign capital in business. In all but a few exceptions, foreign capital in any Spanish industrial enterprise is now limited to 25 per cent.

In addition to this more relaxed attitude toward foreign money, Spain now is considering hiring a top-level oil consultant to serve the Government. Reports from Madrid last week had Herbert Hoover, Jr., who recently resigned as assistant U. S. secretary of state, being considered for the post by the Spanish.

Present search . . . Spain has no oil production, but at least three oil exploration programs are under way in the country, all under sponsorship of the government. One program is a partnership operation involving American capital headed by General American Oil Co., Dallas, and the government's Instituo Nacional de Industria. This group recently abandoned a 10,470-ft. well at Puigreig near Manresa as a dry hole.

The major oil discovery at Parentis in France has spurred official Spanish thinking in terms of oil production for Spain.

New Oil Found in Maracaibo

Mene Grande Oil Co. (Gulf) has a new discovery in Lake Maracaibo off San Timoteo.

The well, Ceuta No. 1, blew out early this month and caught fire. It was extinguished a week later by Red Adair, of the organization of Myron Kinley, Houston oil-well firefighter.

Gulf officials were saying little about the well last week, but authoritative sources in Venezuela said it discovered a new productive zone below 8,000 ft.

The well is in an undeveloped area but is not on acreage acquired in the recent award of new concessions by the Venezuelan Government. Reports from Venezuela indicate the well was spudded in April and had drilled to below 10,000 ft. by the end of July.

There were unconfirmed reports in Venezuela last week that Creole Petroleum Corp. had made an important discovery in the lake.

Syria's Pinch Good Omen

● **Prospects of Lebanese shutting off products may force Beirut to allow a speedy repair of damaged I.P.C. line**

PRESSURE is being applied on Syria by the U. S. Government to allow restoration of pipelines crossing the country. But little Lebanon may turn the trick much more quickly.

Syrian officials last week still were standing pat. They were waiting for British and French forces to pull out of Egypt before even discussing repairs on the bomb-damaged pump stations on the Iraq Petroleum Co.'s system. Official weight of the U. S. Government was being used to hurry Syria up.

Lebanon may do the trick easily. Reports from Beirut indicate the Lebanese Government has told Syria she'll have to look elsewhere for oil supplies after January 10.

When the I.P.C. pipeline system was bombed and put out of commission 7 weeks ago, Lebanon froze crude supplies in storage at Tripoli, Lebanese terminal of the I.P.C. system.

At that time there was about a 50-day supply of crude for the 11,550-bbl. daily refinery at Tripoli. The idea was that this crude supply would be needed for internal consumption in Lebanon and Syria.

Last week Lebanon told Syria that this supply is about used up. The Lebanese say they'll also need the output of the 9,000-bbl. Sidon refinery for themselves. The smaller refinery is at the Mediterranean terminal of Trans Arabian Pipe Line which is still operating.

Lebanon would like to see the I.P.C. lines repaired speedily because one branch of the system ends at Tripoli, and Lebanon would like to resume its talks with I.P.C. about an increase in royalties for allowing the oil to move through the country.

U. S. protests . . . The Lebanese move came after the United States protested officially to Syria for dragging its feet over allowing I.P.C. personnel to inspect the damaged lines and begin repairs. The protest was made to Farid Zeineddine, Syria's ambassador to Washington, by Undersecretary of State Herbert Hoover, Jr.

The same day this protest was made, Syrian Public Works Commissioner Hajeddin Jabri said in Damascus that Syria will not pay for repairing the lines and will not allow any repairs to be made until all British and French troops are out of Egypt.

The 600-mile pipeline system moved about 550,000 bbl. of Iraq oil daily to Eastern Mediterranean ports in both Syria and Lebanon before three pipeline stations were destroyed by explosives. I.P.C. believes it could bypass the damaged pump stations and move about 200,000 bbl. daily through the system as a temporary measure until the stations are repaired or replaced.

Embarrassing . . . Speculation about a new pipeline system from Iraq to Turkey's Eastern Mediterranean shore is embarrassing Iraq Petroleum Co. in the volatile Middle East.

There seems to be little question that such a line through Turkey will be built eventually. The point I.P.C. would like to get across in the Middle East—and also in the West—is that such a line is a future project and would not replace the damaged pipeline system across Syria and Lebanon.

An I.P.C. spokesman in Baghdad last week said all speculation about the project in the immediate future only reveals ignorance of the situation. He hastened to add that such a pipeline would supplement—and not supplant—the present system which the Syrians damaged in an antiwestern gesture.

I.P.C. and the western world are exerting efforts right now to persuade the Syrians to allow the quick repair of the pipeline system and get it back into operation. All the talk of an Iraq-to-Turkey pipeline is not helping an extremely delicate situation.

Iraq is ready . . . Iraq finds herself in an unenviable position.

Just when she would like to be increasing oil output and revenue, her oil production is almost completely shut down. The whole Suez affair has put a crimp in Iraq's plans for stepped up production.

Turkey, from all reports, would greet the idea of the new pipeline with delight. It would mean an additional oil supply for Turkey, plus revenue in pipeline tolls for moving the Iraq oil across the country to Iskenderun on the Mediterranean.

Preliminary surveys for such a line have already been made, but I.P.C. officials say much more survey work must be done before any active construction could begin. In addition, the company faces the prospect of trouble in obtaining pipe for the line—after a definite decision on the pipe size.

Two tests planned as . . .

. . . Colombian Deal Closed

A NEWLY formed company with headquarters in Houston will start drilling immediately on a 40,000-acre concession in Colombia.

Delta Colombian Oil Co. has acquired the Floresanto concession formerly held by Socony-Vacuum Oil Co. The new firm is committed to drill one well and start another by January 25.

Delta Colombian was formed by a group of Texas and Louisiana independent oil men and business men. Harris Masterson, Houston financier, is chairman of the board and vice president. President of the company is D. E. Vasser, New Orleans drilling contractor. Other officers include A. E. Masterson, Houston oil operator, vice president and secretary, and Fred Williams, Houston attorney, also a vice president.

A spokesman for the company said Socony drilled 12 shallow wells in the area from 1945 to 1947 and found oil in 10 of them at depths ranging from 200 ft. to 1,800 ft. The concession later was taken over by Dr. Victor Oppenheim, Dallas consulting geologist.

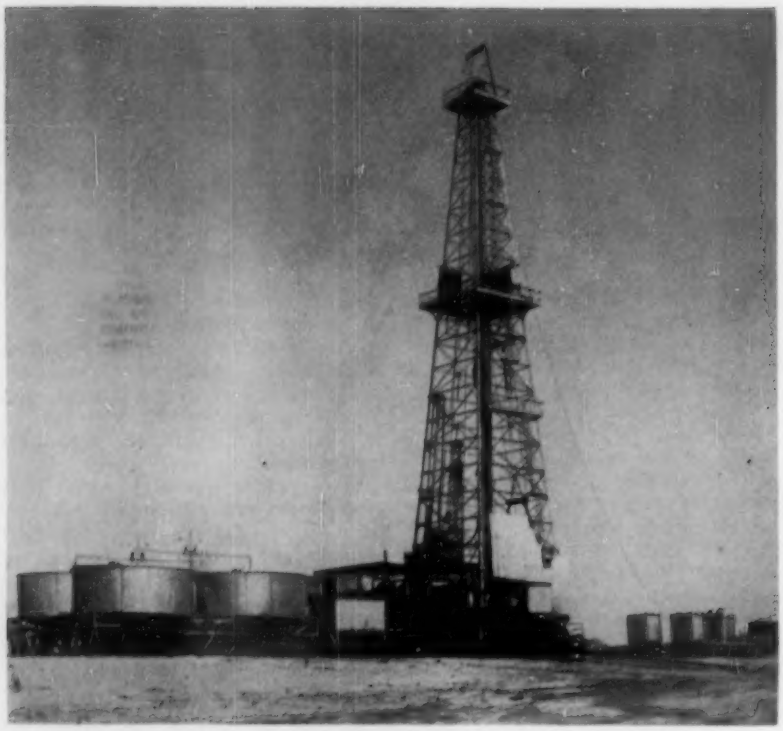
The concession is in the State of Bolivar, about 30 miles southwest of Monteria and 140 miles south of Cartagena on the Caribbean Coast.

Any production from the concession will be barged down the Sinu River to the coast. The company reportedly has made arrangements to sell crude to the Cartagena refinery operated by the Standard Oil Co. (N. J.) subsidiary, International Petroleum (Colombia), Ltd.

Under terms of the concession, the Colombian Government will receive 13 per cent royalty on any production to be established.

Delta Colombian has sent three crews and a rig to the South American country to resume exploration.

Directors of the company, in addition to the officers, include Raymond Hill, Houston attorney; E. W. Bartlett, Jr., Houston oil operator; Neill T. Masterson, Jr., Houston investment banker; Frederick Korth, Fort Worth business man; J. Mort Walker, New Orleans attorney; and John P. Labouisse, New Orleans investment banker.



Aramco skids rig 4 miles in . . .

. . . Stepout for Kharsaniyah Find

ARABIAN AMERICAN OIL CO. is drilling a 4-mile stepout to its new field discovery, Kharsaniyah, on the Persian Gulf Coast of Saudi Arabia.

Kharsaniyah 1 has been completed as a producer in the "D" member of the Arab zone after it was drilled to 7,621 ft. The rig was skidded 4 miles north and spudded in for the second well just a few days ago.

Aramco said last week that productivity tests on the discovery well are still in progress. The company declined to reveal any new data on the potential of the well.

When the rank wildcat entered the top 22 ft. of the "A" member of the Arab zone last June it flowed 2,200 bbl. daily with 800-psi. surface pressure on a drill-stem test of the 5,954-76-ft. interval *(The Oil and Gas Journal, June 25, page 83, and July 2, page 79).*

The discovery, the first test of the Kharsaniyah structure, is 80 miles northwest of Dharan where Aramco maintains its headquarters. It is just 2 miles from the 140-mile, 22-in. crude line being built from the company's offshore field, Safaniya, to Ras Tanura.

The "A" member of the Arab zone which was the first tested in this well does not produce in any Saudi Arabian field except Damman where it is structurally 1,900 ft. higher than at Kharsaniyah. Aramco said that the A, B, C, and D members of the zone were all found to be productive in the latest discovery.

The "D" member is the main pay in Ghawar, Qatif, Abqaiq, and Damman and accounts for almost all Saudi Arabia's production of more than a million barrels of oil daily.

Norway Refinery Planned

Norway gave Standard Oil Co. (N.J.) the green light last week on its plans for a 40,000-bbl. refinery on the east side of the Osle Fjord in southern Norway.

The refinery will easily be the largest in Scandinavia *(The Oil and Gas Journal, August 6, page 72).* It will furnish all major product requirements for Norske Esso. In addition, it will provide about 25,000 bbl. daily for export to Sweden and Denmark. The refinery will operate on Middle East crude.

Construction will begin in 1958. Jersey Standard estimates the cost at $29 million, 60 per cent of which will be in the form of dollar capital. Among the units planned in the plant are Powerforming and Hydrofining.

Israel Line Debated

Eilath-to-Haifa project being pushed by French

FRENCH proposals to build a pipeline from the Red Sea across Israel to bypass the Suez Canal remained a very active political football in Europe last week.

Both the European and Israeli press have given the project the full treatment. Israel has remained officially silent. But French Foreign Minister Christian Pineau said flatly last week that such a line will be built.

The one question that remains unanswered is where the oil for such a pipeline is coming from. With Arab hatred for Israel at a fever pitch since the Franco-British-Israeli invasion of Egypt, no Arab oil-producing nation would sell anyone crude destined for an Israeli pipeline.

The French first proposed building a 30-in. line from Eilath on the Gulf of Aqaba to Haifa. Such a line would have a 400,000-bbl. daily throughput. All except a small amount of oil retailed in Israel would be destined for Europe.

Early this month the Israeli newspaper Davar, published by Premier David Ben Gurion's labor party, claimed the French were postponing plans for this line. The delay was requested by "American oil interests" until "a more suitable time." Instead, the paper reported, the French would build an 8-in. line over the same route.

Pineau made his flat assertion that a large diameter line will be built in answering parliamentary critics of Anglo-French policy in the Middle East. He refused to elaborate on his Paris statement, but said only that work on the pipeline "will begin in a short time."

Discovery Attracts Offsets

Sinclair Oil Corp.'s major discovery in the State of Monagas in eastern Venezuela last September has sparked new drilling activity in that region.

Venezuelan Atlantic Refining Co. is drilling below 8,700 ft. at the 1 Cato, only 100 meters from the discovery, and Sinclair is drilling an offset of its own.

The Atlantic subsidiary and Pancoastal Petroleum Co., C. A., have a 50-50 ownership in a 13,411-acre concession which adjoins Sinclair's block. Atlantic and Pancoastal contributed to the discovery drilling cost.

Sinclair's subsidiary, Venezuelan Petroleum Co., tested two productive

sections in the discovery well, the 3 Aguasay, which was drilled to 14,221 ft. Tests indicated the well is good for at least 1,300 bbl. daily *(The Oil and Gas Journal, October 1, page 70, and October 29, page 83).*

Syria Test Planned

Well to be first Middle East venture by Germans

SURFACE exploration crews of a West German oil company are at work in Syria and the company plans to start its first well in northeast Syria "within weeks."

The 5,800-sq. mile concession granted recently to Soc. des Petroles "Concordia" of Damascus, an affiliate of Deutsche Erdoel A.G. of Hamburg, is the first granted a German company in the Middle East.

The company has agreed to spend at least $5 million on exploration in the next 3 years. In return, the D.E.A. affiliate says it got the "most favorable profit-sharing arrangement in the Middle East." Company officials declined to elaborate.

Dr. Franz Hecht, D.E.A.'s chief geologist, said last week in Germany that he is highly optimistic about his company's prospects. He said a dozen of his company's geologists and geophysicists are at work in Syria and the first of several wells from 7,000 to 10,000 ft. will be drilled in the near future.

Recent strike . . . The only other company with exploration rights in the country is Syrian-American Oil & Gas Co., headed by J. W. MenHall, Benton, Ill., drilling contractor. MenHall's company has a 3,600,000-acre concession with an option to acquire additional acreage.

MenHall's first wildcat is an apparent discovery and is being deepened. The test at Karatchok encountered 150 ft. of pay at 6,650 ft. and oil filled the drill pipe to the surface *(The Oil and Gas Journal, November 5, page 85).*

Wildcat Staked in Burma

Burma Oil Co. (1954), Ltd., is moving in a rig for the first wildcat in Burma since before World War II.

The deep test will start early next year at Ondwe, in the Magwe district. Its objectives are horizons productive in a field 30 miles northwest *(The Oil and Gas Journal, March 26, page 92).*

The company first will drill a shallow well into a known gas zone, where it hopes to find enough fuel to run the steam rig.

Pipeline briefs

Dutton-Williams Brothers, Ltd., has started construction on 47½ miles of 12-in. crude line from Gilbey to Sundre in Alberta for Rangeland Pipe Line Co., Ltd. This link will make it possible to move crude either south to Calgary through the Cremona system or north to Edmonton into the Trans Mountain or Interprovincial lines. Completion is scheduled for August 1957. Dutton-Williams has just completed 10½ miles of 12-in. crude line from Red Deer to Rimbey in the Rangeland system.

Fulton Banister, Ltd., has completed a 117.3-mile, 12-in. gas line for Saskatchewan Power Corp. from Success field to Moose Jaw, Sask. Saskatchewan Power also plans some 300 miles of Regina city distribution lines ranging from 20-in. to ¾-in. This system is to be completed by October 15, 1957. Fulton Banister also has the contract on this project.

Michigan Wisconsin Pipe Line Co. has completed more than 140 miles of big-inch loop lines along its natural-gas system in Illinois and Wisconsin. Houston Contracting Co. and H. C. Price Co. laid 56.2 miles of 24-in., 42.4 miles of 20-in., and 43.2 miles of 16-in.

Standard Oil Co. (Ohio) has a new 38-mile, 8-in. products line ready for operation from Mogadore to Girard, Ohio. Somerville Construction Co. had the contract for the project.

Southern Pacific Pipe Lines, Inc., is building 84 miles of 8 and 10-in. products line from Richmond to Stockton, Calif., to be finished by late spring. Contractor is River Construction Corp. The line is to be extended eventually to Reno and Fallon, Nev.

Magnolia Pipe Line Co. last week completed a 36-mile, 12-in. crude line from Andrews to Midland, Tex. H. B. Zachry Co. was the contractor. Four smaller projects are to be finished by January 1. They include 18 miles of 6-in. L.P.G. line from Beaumont to Orange, 8 miles of 20-in. crude line in Pulaski County, Arkansas, 15 miles of 4-in. L.P.G. line in Winkler County, Texas, and 22 miles of 4-in. L.P.G. line in Lea County, New Mexico.

Service Pipe Line Co. early next year will boost capacity of its crude line from the Southwest to the Chicago area some 26,000 bbl. per day. New pumping stations at Mayview, Mo., and Rothville, Mo., are almost complete. They will permit an increase in throughput to about 325,000 bbl. per day on this section of the system.

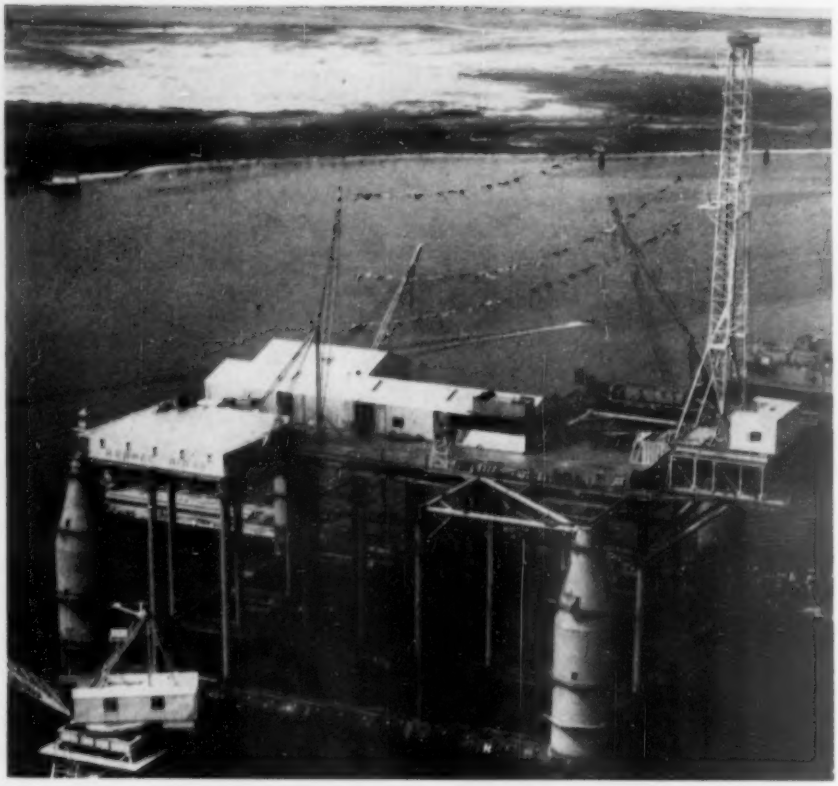
Trans-Canada Pipe Lines, Ltd., has received an additional $10 million from the Canadian Government to finance construction of the 574-mile Alberta-Winnipeg section of the 2,250-mile gas line. The progressive advances to Trans-Canada now total $43,750,000.

The government has agreed to lend the company up to $80 million to finance 90 per cent of the western leg of the line. The advances are administered by the Northern Ontario Pipe Line Corp., which will build and lease the northern Ontario section to Trans-Canada.

Also for Pipeliners . . .

A new look at moving crude from the Four Corners area popped up last week when Texas-New Mexico Pipe Line Co. revealed it will lay a line from the area running east to Jal, N. M. . . . This announcement came while Standard of California and Shell were developing plans to lay a line from the area to California (P. 35) . . . United Gas has completed a difficult pipelining job in Louisiana's marshes (P. 39) . . . A 500,000-bbl. crude line is planned from Delaware Bay to Philadelphia by a new company, Cape Pipe Line Co. (P. 47) . . . An FPC attorney has recommended an application to lay a line to move Texas gas to Florida be denied (P. 47) . . . Great Lakes Pipe Line will expand its product system into Wisconsin (P. 51) . . . A new natural-gas system that works in with the Venezuelan Government's plans for industrial expansion will get under way soon (P. 54) . . . I.P.C. lines in Syria may be repaired sooner than expected if Lebanon refuses to supply Syria with crude (P. 55) . . . Christian Pineau, France's foreign minister, claims a crude line will be built across Israel from the Gulf of Aqaba to the Mediterranean (P. 56).

PLUS THESE TECHNICAL FEATURES: Should you buy power or make your own? An expert gives some answers (P. 95) . . . Pipeline Patrol and Construction Tables (P. 95).



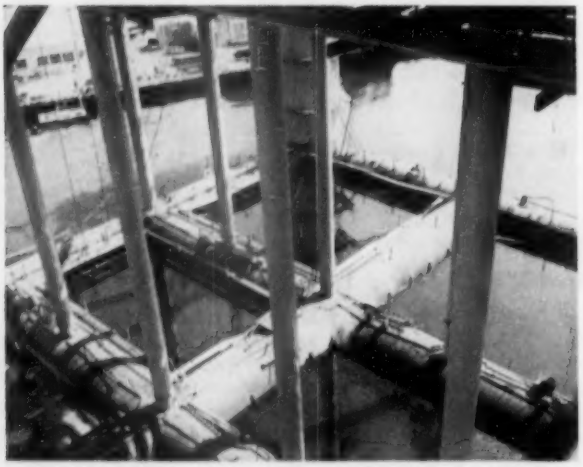
1 KERR-McGEE'S RIG 46 is the widest and longest mobile offshore structure yet launched.

by Ed McGhee
District Editor

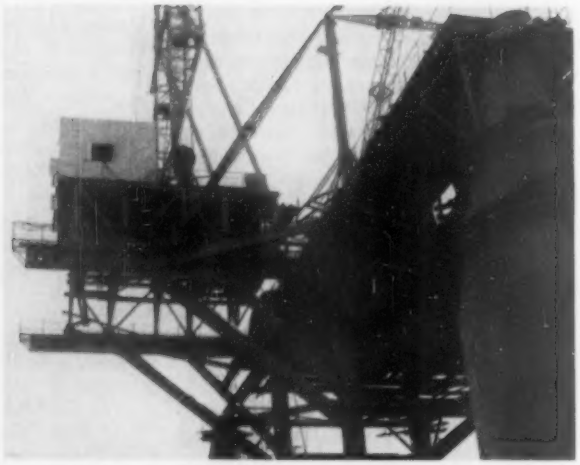
- It's stable
- It's simple
- It's safe
- It's spacious

It's . . .

Something New in a Submersible Barge



2 RIG BASE is made of 14½-ft. steel tubes. Corner columns are 22 ft. in diameter. These are flooded to submerge the barge for drilling.



3 DRILLING is off the side from cantilevered structure. Rig can be skidded in either direction so that six wells can be sunk from one position.

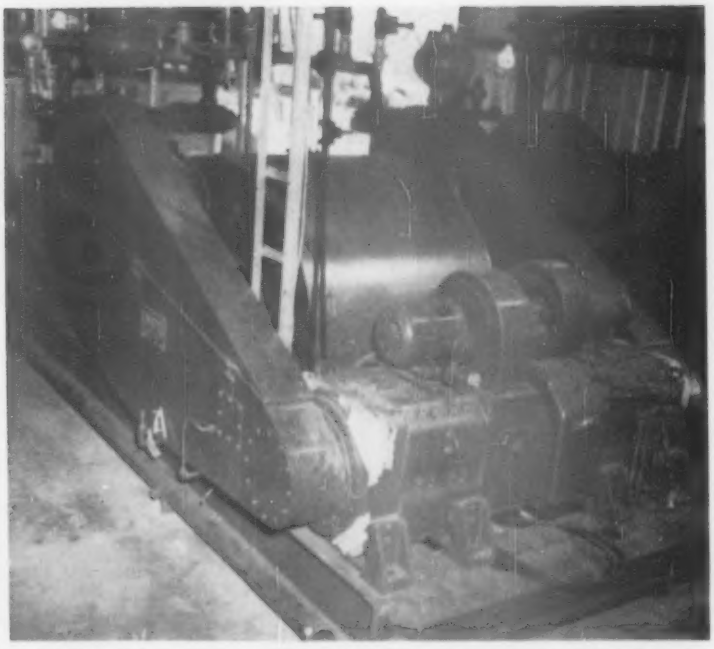
UNTIL recently, the design of submersible barges and mobile platforms for offshore drilling had a limitation on width. The thought was that the structure should not be too wide to move through inland waterways along the Gulf Coast. And, on shallow-water barges, this limited width creates no problem.

But, to make up for being narrow, deep-water structures must add stabilizing devices in order to be moved, lowered, and raised safely. This problem of stability grows with each foot added to operating depth.

Now, with several years of offshore experience behind them, many designers believe that more can be gained by increasing width than would be lost. The

DRILLING

4 JACKS on derrick legs allow it to be tilted for use as a construction boom. It can pick up 250,000 lb. from the water.



5 MAIN MUD PUMPS are rated at 1,000 hp. and are driven by two 625-hp. d.c. electric motors. Motors are series wound with superexcitation control.

added stability of greater width in deep-water operation should more than make up for the loss of ability to move through some inland waterways. As a result, radical new designs are under construction or are in planning.

Longest, widest yet . . . First evidence of this new thinking is Kerr-McGee Oil Industries' new submersible barge, Rig 46; it is the widest and longest mobile offshore structure yet launched. In fact, the device is so wide that it had to be built in two pieces. Each of the pieces was launched separately, then the two were welded together to make the final, complete unit. Construction was at the yards of Ingalls Shipbuilding Corp. at Pascagoula, Miss.

Over-all width is 202 ft.; and length over-all is 242 ft. With these dimensions and with its low-center of gravity, Rig 46 is completely stable. In its operating depth of 70 ft. of water, it is nearly impossible for this structure to be turned over as a result of either accidents in maneuvering or by hurricane weather.

Moreover, when floating with its drilling mast up, Rig 46 is the tallest floating structure of any kind anywhere. From the bottom of its base to the top of its working, or "Texas," deck Rig 46 measures 100 ft. Adding the height of the substructure and the drilling mast make over-all height 268 ft.

Economy but no complication . . . Offshore, just as elsewhere, experience shows that the fewer the complicated mechanisms, the lower the cost and the less the trouble. This fact has made the fixed-deck submersible barge popular for shallow water. It has no jacks, movable hulls, nor the like to add complication, expense, and failures. This is another consideration that led Kerr-McGee to design Rig 46 after the principle of submersible barge.

But, in deep water, submersible barges have their own complications—side pontoons, stabilizing piles, and the like. Since it is stable in itself, Rig 46 does not need even these devices. So, it is as simple in construction and operation as barges operating in shallow inland waters.

Complete cost of construction, fitting out with rig, engineering, and overhead make Rig 46 a $3,300,000 investment. This compares well with the cost of any device of any design for drilling in 70 ft. of water. Yet, because of its simplicity, Kerr-McGee believes Rig 46 is certain to be far cheaper to operate and maintain.

Easy to submerge, raise . . . As Fig. 2 shows, the base of Rig 46 is made up of a grid of 14½-ft. steel tubes. The support columns on the corners are 22 ft. in diameter for the lower 64 ft. of length and taper to 5-ft. diameter on top. To submerge, the tubular grid members and the corner columns are flooded one end at a time. When the water is pumped out, the unit refloats.

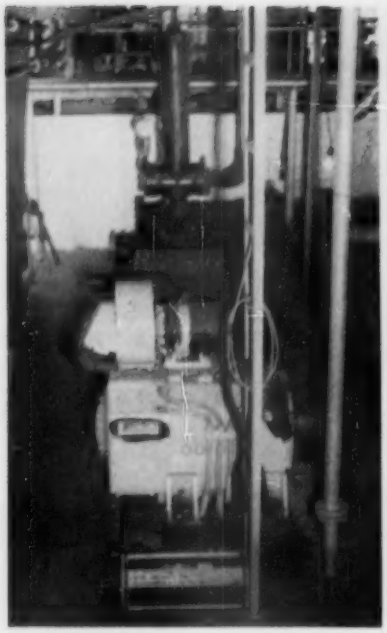
Since the base area is so large, a pump suction at any one point in the base might be out of the water during some part of raising or lowering. For that reason, Kerr-McGee has put two pump rooms in the grid base. Then, regardless of the tilt of the barge, at least one of the pumps will get suction and continue operation.

Other than the four corner columns, there are 22 other supporting members from the base to the deck. Of these, 20 are 42-in. diameter; the other two, 48-in. diameter.

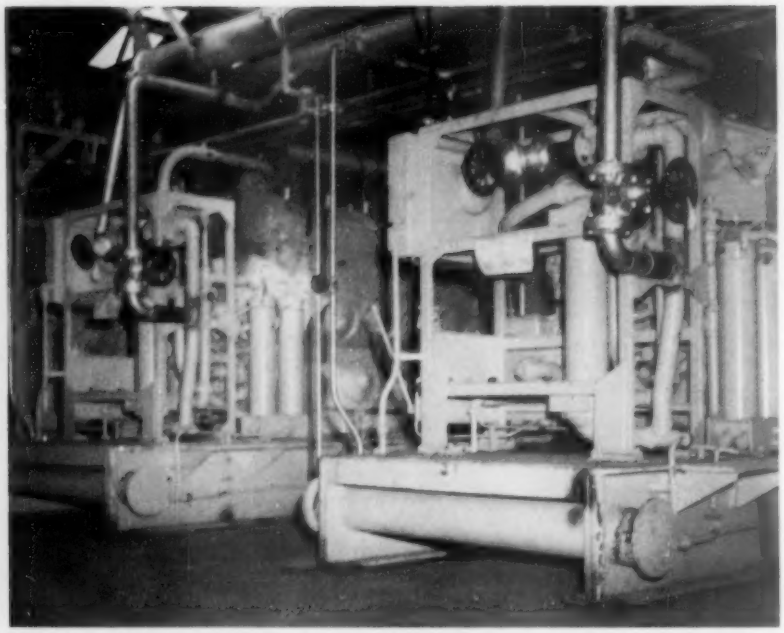
Rig 46 is entirely self-contained and is towed to location by tugs.

Safe backing off wells . . . The conventional slot in the end of most over-water drilling structures is, of course, to allow backing the unit off completed wells. This is simple enough an operation in shallow, calm water. But, in deep water and rough seas, backing off a high-pressure wellhead is a delicate, dangerous maneuver. The narrower and longer the slot, the greater the danger of banging into the well, breaking off the pipe, and causing the well to blow wild. Such a blowout probably would mean fire and complete loss of drilling structure and well.

Most designers believe the best way to reduce danger of backing off a well is to do away with the slot entirely—to drill from over the side of the structure. And, as Fig. 3 shows, this is what Kerr-McGee does on Rig 46. The drilling-mast substructure is supported by two beams 46 ft. apart; these are canti-



6 AUXILIARY PUMP for mud mixing is driven by a single d.c. electric motor.



7 GENERATING POWER for electric system comes from three 875-hp. diesel engines. Each engine drives two 500-kw. d.c. generators. Auxiliary power system is two 500-hp. engines driving a 350-kw. 440-volt a.c. generator.

levered 55 ft. beyond the edge of the deck. When the barge is to be moved, the entire substructure with the draw works and mast on it, are moved back over the deck to be clear of the wellhead.

To drill six wells . . . Actually, the mast substructure is made up of two parts—the lower section resting on its cantilever support, and the upper section movable in both directions on the lower. Thus, the upper section carrying mast and draw works can be skidded by hydraulic rams into different positions to drill as many as six wells without moving the entire barge.

The cost of moving such a large mobile unit as Rig 46 to another location, even if only a short distance away, is great. Moreover, if weather is rough, moving may take several days. For that reason, Kerr-McGee decided to design the substructure to skid and drill several directional holes rather than to plan on moving the entire barge to drill several vertical wells. Besides, one large production platform for six wells is cheaper than six small platforms for that many individual wells.

Another advantage of the substructure arrangement comes during the time the barge is spotted on location. The structure itself need not be pinpointed exactly in regard to well location or previously driven conductor pipe; the barge can be submerged as close to exact location as is possible to do quickly. Then, final adjustment over the well can easily be made by moving the mast substructure.

Double-duty derrick . . . The 151-ft. Ideco mast carried by Rig 46 is the first of its kind ever built. Not only does it act as a normal drilling mast, but it also tilts over the side of the deck to act as a construction boom.

If a well is completed as a producer, there will be no need to bring in a derrick barge to erect a well platform. The mast on Rig 46 can do the job nicely. And, Rig 46 should be able to do the job much more cheaply since it is already on the location. For, if a derrick barge is immediately available, rental on it starts as soon as it leaves its base and continues until it returns there. Any time lost because of bad weather is charged to the operator. And, rental on a large derrick barge is as much or more than the daily expense of operating Rig 46.

When the mast is used as a construction boom, the entire draw-works substructure is moved back onto the platform. The crown block is lowered and restrung; then the mast is tilted by moving its raising legs in the T slots shown in Fig. 4. To help support the mast while it is tilted, guy wires are strung from its top to anchor points on the opposite end of the barge.

From normal drilling, the mast is rated at 750,000-lb. hook load and for 130-m.p.h. winds. It will pick up 250,000 lb. off the water when tilted.

Plenty of elbow room . . . It would have been possible to floor in all of the top level of Rig 46, but the space simply wasn't needed. The working deck is floored into a T shape, 181 ft. across at its widest and 228½ ft. in length at its longest point. There is only a single deck level and that one has enough area for all necessary equipment and operations. Many older designs are pinched for space even with two deck levels.

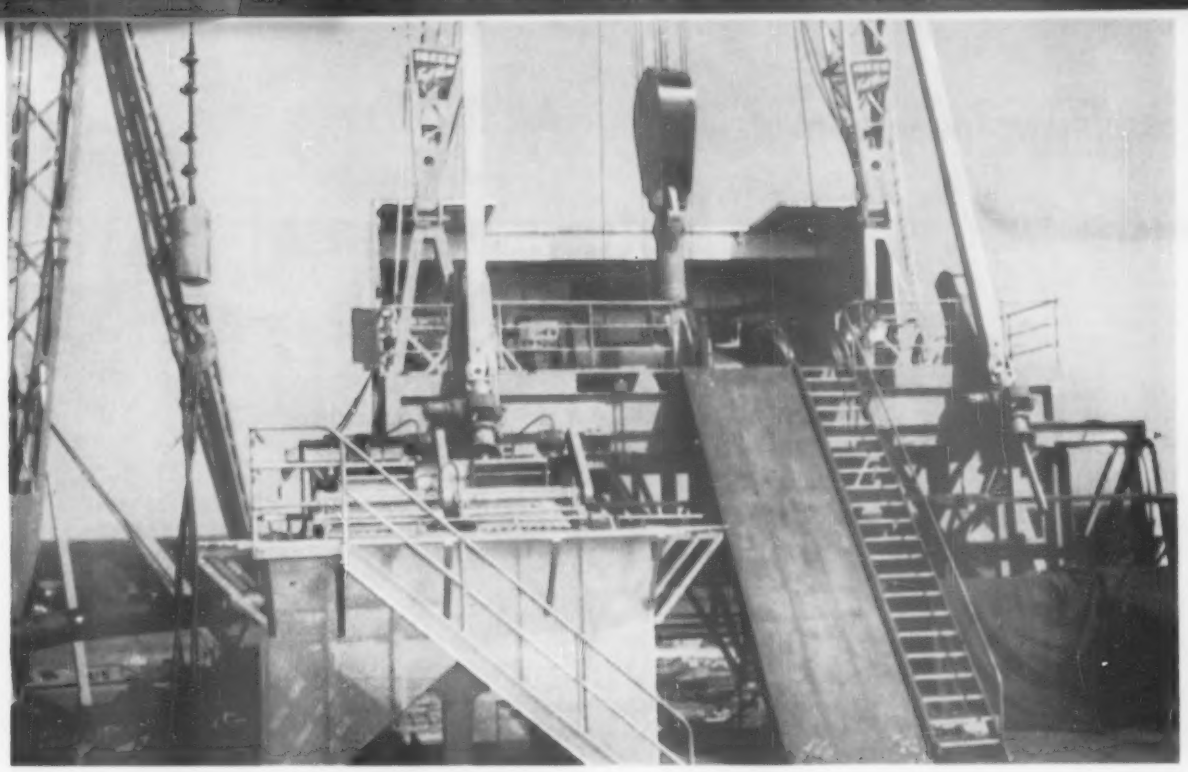
Crew quarters and engine house each occupy one end of the T crossbar. At the base of the T is the mast and draw works. Pumps, mud pits, and pipe racks fill the space between base and crossbar.

Crew quarters have bunking, eating, and recreation area for 50 men. The quarters building also contains the tool pusher's office and a radio room.

Other than drilling fluid, there is little liquid storage on the working deck; it is mostly in compartments in the base. This base storage provides for 3,950 bbl. of drilling water, 780 bbl. of potable water, and 780 bbl. of fuel oil.

Electric rig . . . Because of the movable nature of the drilling-mast substructure, weight on it had to be kept to a minimum. For that reason, Kerr-McGee picked electric drive for the rig. And, thus, the driving engines can be mounted permanently to the barge deck at a point away from the wellhead. The only connections to be made or broken for a move are the mud flow line and the line from pumps to standpipe.

The draw works is an Emsco EDA



8 RIG EQUIPMENT consists of tiltable 151-ft. 750,000-lb. hook capacity mast, 1,600-hp. double-drum draw works, 27½-in. rotary table, seven-sheave crown block grooved for 1⅜-in. line, 450-ton hook and 400-ton swivel. In foreground is dual shale shaker.

double drum. It is driven by two 625-hp. d.c. electric motors mounted on the skid with it. The 27½-in. rotary is independently driven by another d.c. motor which has a torque-limit control that can be adjusted for use with several sizes of drill pipe.

The main mud pumps, two Emsco D-1,000's, are each powered by two of the 625-hp. motors. They are shown in Fig. 5. Mud mixing, Fig. 6, is handled by an Emsco B-14 with a single motor. All of the motors driving rig equipment are identical and interchangeable. Armatures may be interchanged with those of the generators.

Generating power comes from the three traction type of EMD 900-hp. diesel sets. Each engine drives two d.c. generators. These are shown in Fig. 7.

The motor-control system on Rig 46 is new. This super-excitation control is intended to improve performance in deceleration without forfeiting any of the advantages of series-motor operation. When power is cut off from a motor, the new control changes the motor field to make it, in effect, a generator. Thus, the inertia of the armature and its load is converted into electric energy; this energy is dissipated in the generator and engine. The result should be quick and smooth slowing of the motor.

There is a skid-mounted motor-control cabinet containing all switching and protective equipment in the engine house. A separate driller's control panel is on the derrick floor; it contains all operating controls and indicators.

First location for Rig 46 is in Block 59 of the East Cameron area off Louisiana. Water depth is 50 ft. and the operator is the C.A.T.C. group.

Specifications for Rig 46

Over-all width—202 ft.

Over-all length—242 ft.

Over-all height from bottom of base to top of Texas deck—100 ft.

Stabilizing columns on the four corners—22 ft. in diameter for the lower 64 ft. tapered to 5 ft. in diameter in the upper 36 ft.

Lower cylinders of the base barge—14 ft. 6 in. in diameter.

Twenty support columns—42 in. in diameter.

Two support columns—48 in. in diameter.

Stabilizing columns on the four corners extend approximately 6 in. below the bottom of the base barge.

Over-all length of the transverse cylinders of the base hull—194 ft. 6 in.

Over-all length of the longitudinal cylinders of the base hull—234 ft. 6 in.

The Texas deck is 181 ft. in width at its widest point and 228 ft. 6 in. in length at its longest point. The deck is T-shaped with the crew quarters and engine housing on the crossbar of the T and the drilling mast and draw works located at the base of the T. The crossbar of the T is 67 ft. 4 in. in width and the base of the T is 78 ft. in width.

The mast and draw works are at the base of the T-shaped upper deck. During normal drilling, the mast, draw works, and substructure are supported by two beams cantilevered 55 ft. beyond the edge of the deck.

This mast-supporting substructure is in two pieces. It consists of a 14-ft. high truss type of lower section and 3-ft. deep girder type of upper structure. The truss type of lower structure spans the 46 ft. between the two cantilevered beams.

Equipment

Three G.M. EMD 8-567-C 875-hp. engines, each engine driving two 500-kw. d.c. generators. Auxiliary generating system consists of two Caterpillar D-397 500-hp. engines, each driving a 350-kw. 440-volt a.c. generator. All engines are keel cooled.

Two Emsco D-1000 pumps, each powered by two 625-hp. electric motors.

One Emsco B-14 pump electrically powered for mud-mixing services.

Emsco EDA double-drum draw works with 1,600-hp. rating driven by two 625-hp. unitized motors.

Emsco Type PJ 27½-in. rotary table independently driven by one 625-hp. motor.

Ideco 151-ft. high by 30-ft. base drilling mast with 750,000-lb. hook capacity and 130-m.p.h. wind capacity.

One Ideco crown block with seven 55-in. diameter sheaves, each grooved for 1⅜-in. drilling line.

One Emsco MA-6-60 traveling block with six 60-in. diameter sheaves, each grooved for 1⅜-in. drilling line.

One Byron Jackson Model 5450 hook—450-ton capacity.

One Emsco Model L-400 swivel—400-ton capacity.

Liquid-mud capacity is 800 bbl.

Bulk-mud weight material is stored in one 2,400-cu.-ft. bin with additional space on the deck for storage of upwards of 5,000 sacks of mud in 50-sack skip buckets. In addition to the weight-material storage, there is a 37 by 50-ft. room for sack storage of cement and other mud additives.

Material handling equipment includes two stiff-leg derricks with maximum reach 105 ft. and a fork-lift truck for handling materials in the enclosed areas.

The rig also includes a Halliburton T-10 cementing unit and Schlumberger logging unit.

QUANTITATIVE LOG ANALYSIS—3

The S.P. Curve: Determination of R_w, R_{mf}, R_{mf}/R_w, and SSP

by Dr. R. G. Hamilton and Paul Charrin

IN quantitative log analysis R_w is required for the determination of Φ, F, and S_w. If accurate water analyses are available, R_w should be determined from these using Chart 2 (Part 2).

The following equation represents the SSP for many formations in many areas:

$$(SSP)\ E_c = -K \log_{10} R_{mf}/R_w;$$

$$K = (60 + 0.133 \times T°)$$

K is thus seen to be a function of temperature. It is also a function of ionic constitution of the formation waters. However, for waters containing principally NaCl and where R_w is no less than 0.08 at 75° F., this relationship has given exceptionally good results.

Transformations of the equation makes it possible to calculate SSP, to estimate R_w, or to estimate R_{mf}.

The authors are, respectively, head of Hamilton Well Log Consultants, Tulsa, and president of Perforating Guns Atlas Corp., Houston.

PRODUCING

Use of Chart 4

Calculation of SSP: Use of K for formation temperature. Obtain R_{mf} by direct measurement or from Chart 3 (Part 2). Obtain R_w from water analyses, catalogs on the formation, or

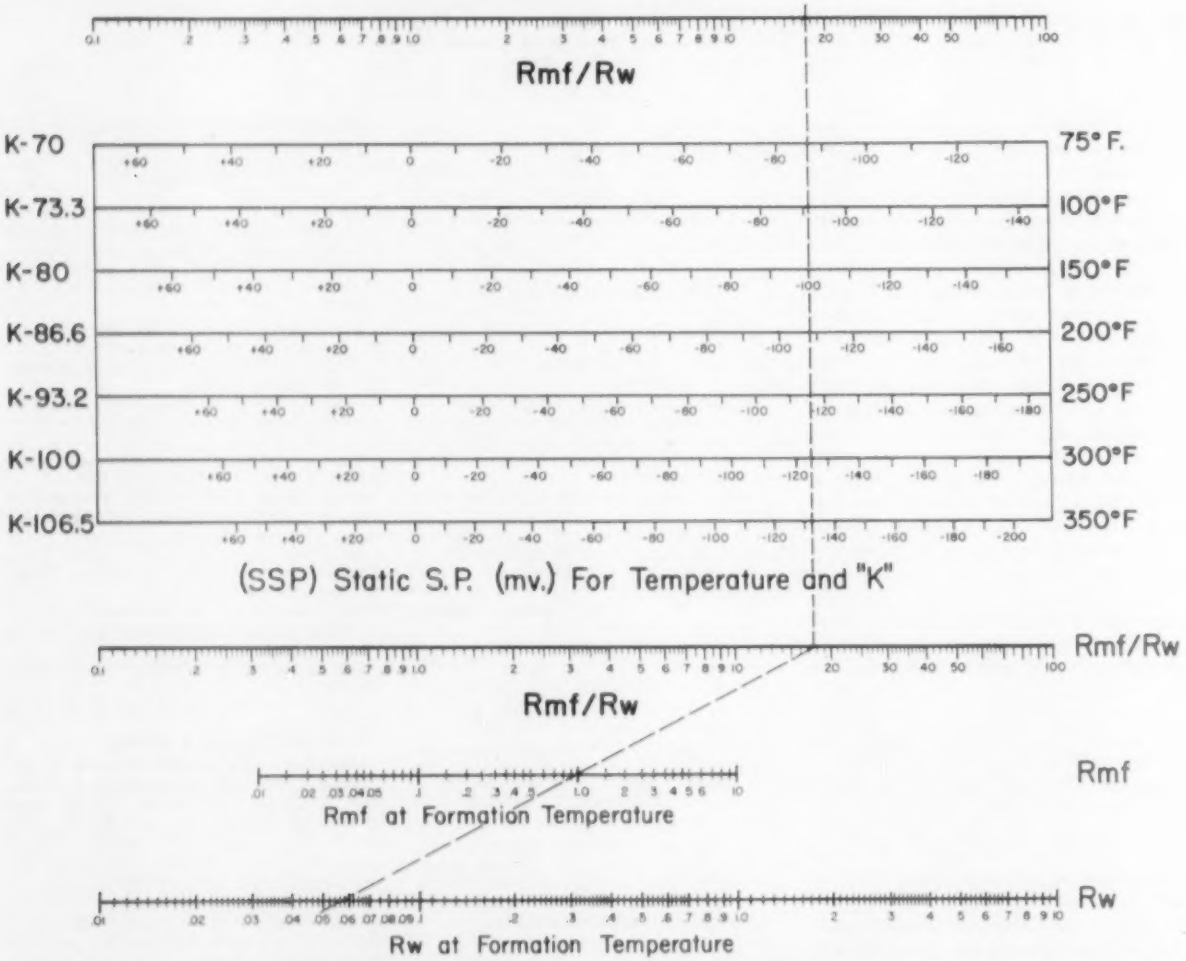


Chart 4—This chart solves the equation relating SSP to R_{mf} and R_w. For any given temperature, find the SSP on the horizontal scale and locate the ratio, R_{mf}/R_w by means of a vertical line. The nomograph at the bottom gives either R_{mf} or R_w.

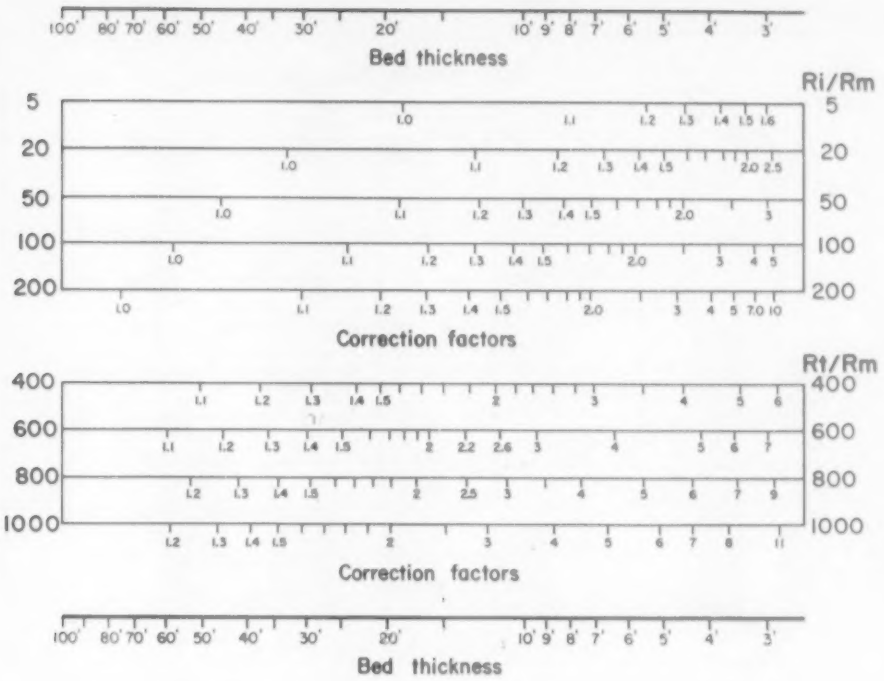


Chart 5—S.P. correction for bed thickness (based on 8 to 9-in. holes). Determine R_i/R_m from 16-in. normal resistivity curve. Determine bed thickness from S.P. inflection points and, or, microsurvey log. Place rule vertically across bed thickness and read S.P. correction factor on appropriate scale. SSP = ASP × correction factor. Follow same procedure when R_t/R_m is used in high-resistivity beds.

from analysis of the SSP of the same formation in an adjacent log. Solve for SSP.

Example: $R_w = 0.056$ at 150° F. (From analysis or catalog.) $R_{mf} = 1.0$ at 150° F.

Draw line through $R_w = 0.056$ and $R_{mf} = 1.0$. Read $R_{mf}/R_w = 17.8$. Place rule vertically through 17.8 using lower and top R_{mf}/R_w scales. Read SSP = −100 mv. on 150° F. SSP scale.

S.P. correction: Only thick, nonshaly formations of low resistivity exhibit S.P. equal to SSP. To determine R_w using a thin bed it is necessary to correct the ASP of the bed to the SSP the bed would have as a maximum.

The ASP of a thin bed is the result of the influence of the hole factor, e/d, (ratio of bed thickness to hole diameter), and the resistivity ratio, R/R_m. When e/d is high and, or, the R/R_m low, the ASP of the bed is close to SSP. Conversely, when e/d is low and, or, R/R_m is high, the ASP is very low. R may be R_i or R_t as in Chart 5.

S.P. correction charts are constructed to correct the ASP to SSP for these factors. The original Doll[7] chart employed R_t/R_m. Recently charts employing R_i/R_m have been introduced. Chart 5 gives corrections for average hole diameters of 8 to 9 in. for R_i/R_m 5 to 200 and R_t/R_m 400 to 1,000.

Estimation of R_w: Obtain SSP. (For thin, resistive beds correct ASP to SSP by Chart 5.) Use the K for formation temperature. Obtain R_{mf} by direct measurement or from Chart 3. Calculate R_w from the transposition:

$$R_w = R_{mf}\ (10^{SSP/K})$$

Example: SSP = −100 mv. Temperature = 150° F. $R_{mf} = 1.0$ at 150° F.

Place rule vertically through SSP = −100 mv. on 150° F. scale. Read $R_{mf}/R_w = 17.8$ on lower or top scale. Draw line through $R_{mf}/R_w = 17.8$ and $R_{mf} = 1.0$. Read $R_w = 0.056$ on bottom scale.

Estimation of R_{mf}: Frequently R_{mf} is unknown because: (1) R_m is not given, (2) there is some question as to the R_m validity; or, (3) the temperature of measurement of R_m is not given. R_{mf} may be approximated opposite a formation from the S.P. equation.

Obtain SSP. (For thin beds correct ASP to SSP by Chart 5.) Obtain R_w from a water analysis, water catalogs, or from the SSP in an adjacent log of the same formation where R_m and R_{mf} are known. Use the K for formation temperature. Calculate R_{mf} from the transposition:

$$R_{mf} = R_w \times 10^{-SSP/K}$$

Example: SSP = −100 mv. Temperature = 150° F. $R_w = 0.056$ at 150° F. from water analysis or R_w catalogs.

Follow above procedure and determine $R_{mf}/R_w = 17.8$. Draw line through $R_{mf}/R_w = 17.8$ and $R_w = 0.056$. Read $R_{mf} = 1.0$ on second scale from bottom.

CAUTION: Wyllie[5] indicated the advisability of employing activities rather than resistivities for a more precise determination of R_w from the S.P. equation.

Very recently, Goundouin, Tixier, and Simard[6] stated that activities should be used for very saline waters but that the equation gives good results for less-saline waters composed essentially of NaCl. In the same paper the authors present practical methods for the accurate determination of R_w for conditions where equation given above frequently fails. These conditions are: (1) Fresh formation waters where R_w is greater than 0.3 at 75° F., (2) muds containing appreciable amounts of soluble calcium salts such as gypsum or $CaCl_2$, (3) very saline water where R_w is less than 0.08 at 75° F.

Note: List of references was published at the end of Part 1 in this series, in the issue of November 12, 1956, page 192. **End.**

This Series—in Review And Ahead

Part 1 of this series, November 12, contains definitions of symbols, basic equations, and step-by-step procedure for quantitative log analysis. It also contains methods for determining bore-hole and formation temperatures. Part 2, December 3, shows how to get mud-filtrate, mud-cake and water resistivities at formation temperatures. The next part, Part 4, will show how true formation resistivity can be determined from normal and lateral curves.

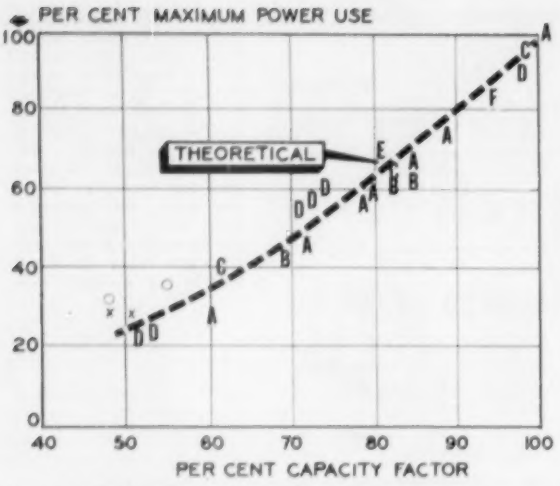


Fig. 1—Relation between energy usage and capacity usage expressed from data in Tables 1 and 2.

A—7 years, four 800 hp. stations, 130 miles.
B—4 years, three 600-hp. stations, 191 miles.
C—3 years, fourteen 1,800-hp. stations, 455 miles.
D—6 years, six 1,000-hp. stations, 168 miles.
E—1 year, twenty-nine 3,750-hp. stations, 1,454 miles.
F—1 year, twenty-six 4,500-hp. stations, 1,254 miles.
X=1949-1952 operating experience for all interstate products pipelines reported by USBM.
o=1949-1952 opertaing experience for all interstate crude-oil trunk lines reported by ICC.

Are you trying to decide . . .

What Type of Prime Mover?

If so, you'll need a satisfactory answer to the question, "What will be the relation between 'capacity factor' and 'energy-use factor,' generally called load factor, during the expected life of the project?"

How to get an answer? Study the history and experience of similar projects. Which, briefly, is the predicate of this discussion.

There's much to consider when deciding whether to . . .

Buy Power, or Make Your Own?

by W. H. Stueve
Consulting Engineer

PURCHASED vs. privately generated power is one of the most controversial matters for discussion whenever a group of engineers meet to select the prime mover for any project in the petroleum industry. The problem also is the most difficult to solve, because it involves a broad knowledge of not only application engineering, but also a working knowledge of economics, materials, equipment, and construction costs.

The following list of questions involved in studies of this nature will give you some idea of the complexity of the problem, and answers must be obtained before progressing very far into the study:

1. What is the expected life of the project?
2. What interest and depreciation rates will be acceptable?
3. How much operating labor will be required?
4. How much maintenance will be required?
5. What type fuel? Cost? Adequacy of supply?
6. Cost of electric power, adequacy, and continuity?
7. Will standby units be required?
8. How will seasonal demands affect the capacity factor?
9. Most economic pipe diameter, station spacing?
10. What will be the relation between "capacity factor" and "energy-use factor," generally called load factor, during the expected life of the project?

These are just a few of the questions arising. All have an important bearing upon the conclusions and resultant recommendations of the engineers engaged in the study.

There are many variations and other questions which require some kind of answer. So it is obvious that the choice between purchased power and mechanical power rests in obtaining specific answers to a great number of questions which are definitely unanswerable to a great degree.

Because this paper is concerned with pipelines primarily, the term mechanical power is used instead of privately generated power, since the term generated might imply electric power is being studied.

Generated electric power as such is rarely considered for pump stations except in a few isolated cases where the producing companies have surplus power available to supply the originating field pump station.

Liquid Lines

In the list of questions above, No. 10 is the most indeterminate yet the most important in selecting the type of prime movers or source of power.

Load factor or its related capacity factor for any kind of business has an effect on everything we do. And if a mistake is made in the first instance, great losses and eventual failure of the project can occur.

If the load factor of any given proj-

PIPELINING

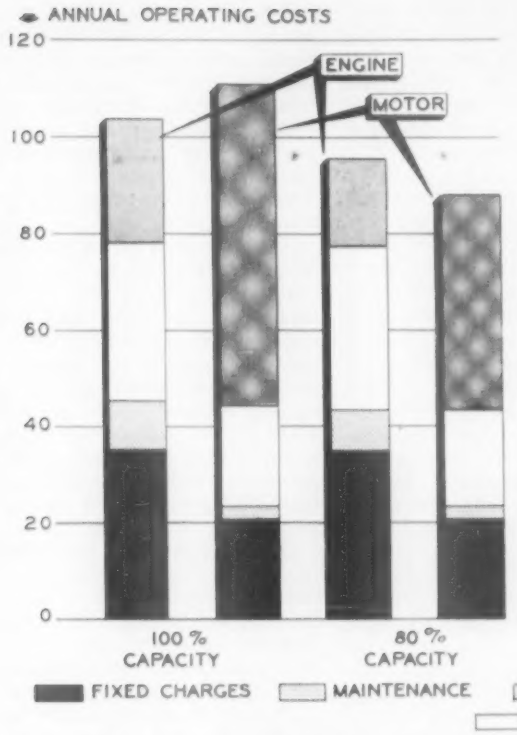


Fig. 2—Effect on total operating costs as long-range capacity changes occur. (Typical 1,000-hp. pump station.)

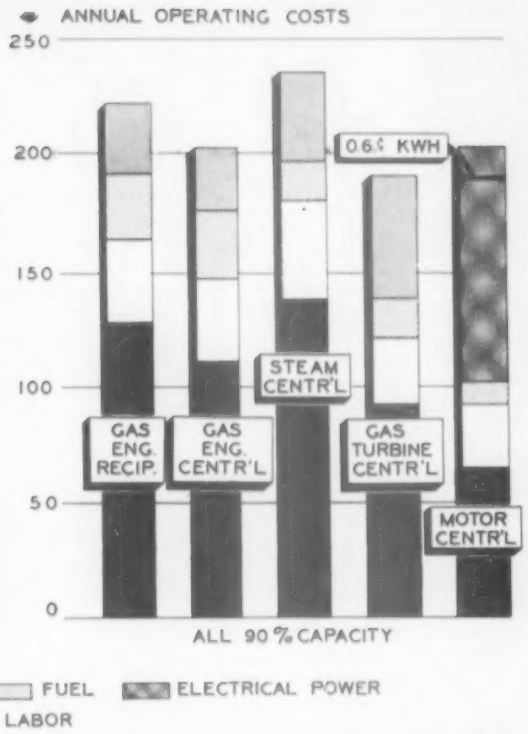


Fig. 3—Relative costs for five accepted methods of gas pumping. 300 M.M.c.f.d., 24-in., 10/32-in., 55 miles, compression ratio, 1:2. Design: 60° F., 0.60 sp. gr., K 1.25, 14.4 psia., b.hp. 3,900, 930 psia., 90 per cent capacity, 270 M.M.c.f., compression ratio 1:15, b.hp. 2,100, 945 psia. (See Table 7.).

ect is so important, how can conclusions ever be reached or recommendations be made? The best answer would be to study the history and experience of similar projects. This is essentially the predicate of this discussion.

Capacity factor average . . . Table 1 is presented for several crude pipelines. They serve a variety of territories, are dependent upon a variety of ultimate purposes, cover periods of time of depression, boom, and war. The record will illustrate the fact that projects rarely live up to the expectations of the promoters, who always think in terms of 100 per cent capacity during the life expectancy.

From the above data it can be noted that capacity factor averaged for the time of study is always less than 100 per cent. Further, there is a definite relation between energy usage and capacity usage, which can be expressed in a general manner as:

Electric-power usage (kw.-hr.) when expressed as a per cent of installed nominal full-load energy-taking capability (standby units not included) will equal the second power of capacity factor when expressed as a per cent of the maximum design capability (barrels per day).

This rule seems to follow for the average for the total time, or for individual years as selected.

It is not to be construed that no individual pipeline will operate at 100 per cent capacity, for there must be some that do, but rarely is this accomplished. The results shown in Table 1 are the historical and experience record.

Energy usage . . . Not being exactly satisfied that the rule, energy usage equals capacity usage squared, as shown

TABLE 1—ACTUAL DELIVERIES (BBL.) AND ENERGY CONSUMED (KW.-HR.) FOR SIX ELECTRIFIED PIPELINES

Pipe-line	Data years	1,000 bbl. Maximum possible throughput	1,000 bbl. Actual barrels pumped	Average per cent capacity factor	1,000 kw.-hr. Maximum possible energy required	1,000 kw.-hr. Actual energy consumed	Average per cent electric usage (actual)
A	7	102,200	81,439	79.5	147,168	91,763	62.1
B	4	52,560	43,395	82.5	42,800	26,553	62.2
C	3	104,025	87,028	83.5	420,000	288,743	68.8
D	5.75	126,000	92,387	73.2	181,000	103,696	57.5
E	1.5	128,700	105,960	82.0	1,130,040	751,946	66.5
F	1.66	200,640	191,197	95.2	1,365,811	1,276,458	93.3

TABLE 2—RELATION BETWEEN CAPABILITY OF ALL PRODUCTS AND CRUDE PIPELINES IN UNITED STATES AND ENERGY REQUIRED FOR 1949 AND 1952

Year	All lines equivalent diameter (in.)	Total interstate miles	Millions barrel-mile	Per cent capacity factor	Estimated active installed hp.	Per cent energy usage
Product Pipelines						
1949	7.5	20,881	92,562	51.5	267,000	27
1952	8.4	27,155	142,425	48.2	380,000	29
Crude-Oil Lines						
1949	9.8	71,373	497,178	47	1,200,000	33
1952	10.7	75,228	714,722	54	1,600,000	35

THE AUTHOR

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Paper was presented at A.I.E.E. Petroleum Industry Electrical Conference September 17-19, Kansas City.

in Table 1, the author made a further study. It was based on data published by the U. S. Bureau of Mines for products lines, and U. S. Interstate Commerce Commission records for crude-oil lines for the years 1949 and 1952. Intermediate years were not considered essential due to the construction lag of lines being installed, which might distort results.

In preparing the results tabulated, several assumptions had to be made, since the United States agencies' data are lacking in some of the important elements desired. It was assumed that the average velocity was 5 ft. per second, and the average energy required was 0.007 hp.-hr. per bbl.-mile, both being a medium value for a great number of lines studied.

To illustrate relation between energy usage and actual deliveries of the pipelines shown in Tables 1 and 2, the yearly data are plotted on Fig. 1. And it can be noted that all the points fall fairly close to the theoretical curve. Thus the inference can be made that pipelines do not operate at full design capacity (100 per cent) when considered individually or as a group, as in Table 2. Moreover, the energy required at such reduced capability (barrels per day), when integrated for a long period of time, falls off faster than by direct proportion.

In studying the cost of performing pumping operations with internal-combustion engines or with electric motors using purchased power, the method employed generally makes this assumption:

The equipment will operate at 100 per cent capacity throughout the entire life of the project.

This assumption works out fine for the engine manufacturer, as illustrated in Fig. 2. However, if history and past experience is worthy of consideration, a glance at Fig. 1 will show that the most points of the six individual lines shown in Table 1 are predominant around the 80 per cent capacity-factor usage of the active installed nominal rating of the electric motors.

Individual line records . . . Also note from Fig. 1 that Pipeline A operated at 100 per cent capacity only 1 out of the 7 years studied, and that for 5 years the capacity varied between 77 and 88 per cent. This pipeline was the first completely electrified line of 1929 vintage and served West Texas.

Pipeline B never operated at 100 per cent capacity factor for a full year during the 4 years studied, and averaged about 80 per cent capacity.

Pipeline C operated only 1 year at near 100 per cent capacity, and during the other years fell to 62 and 82 per cent.

Pipeline D operated only 1 year at high capacity, and during the remaining time of 5 years at a low of 50 to 72 per cent.

Pipelines E and F were the 20-in. products and 24-in. crude lines of the Big Inch system; yet during the war they could not be maintained at 100 per cent capacity.

Note also that the points from Table 2 for all products and crude lines based on U. S. Government reports fall very close to the theoretical energy-use vs. capacity-factor curve.

This is history, as mentioned previously, and should be used as a guide for future projects.

Cost study . . . Fig. 2 has been prepared from contractors' estimates using centrifugal pumps, either geared to engines or direct-motor drive resulting in an investment ratio of about 1.7:1 for motors.

Fixed charges are made up of interest, depreciation, and insurance, and considered at one-seventh of the investment in station equipment. Standby units are not considered in either case. Operating labor is considered in the ratio of about 1.8:1 for the motor station.

Maintenance is considered in the ratio of 3.5:1 for motors, and engine fuel and lubrication is considered as being worth 40 per cent of an equivalent energy unit of purchased power. Definite dollar values have not been assigned to these operating items of expense, since it is realized that if the problem were given to, say, 19 engineers, 19 answers would be obtained. However, the ratios given are within reasonable levels, and are stated merely to illustrate the effect on annual operating costs where long-range capacities average lower than design capacity.

Referring again to Fig. 2, it can be noted that 100 per cent capacity of the engine-operated station costs about 5 per cent less than the electric station; however, at 80 per cent capacity, the electric station operates about 9 per cent less than the engine station. The lower the values of capacity factor the greater the savings with electric motors.

The term electric-load factor as used by the power salesman can be 100 per cent monthly even when the electric usage is 65 per cent of the motor capability on an annual basis or long-period basis of several years. This is provided the demand carryover or ratchet demand is not in excess of about 50 per cent or on a month-to-month basis of billing demand. Electric-power usage of 65 per cent does not mean the monthly load factor is 65 per cent.

If any of the cost factors (Fig. 2) for 80 per cent capacity factor are changed materially such as cost of fuel for dual-fuel engines with natural gas obtainable at 25 cents per 1,000 cu. ft., the electric-station cost would be about equal to the engine-station cost.

The electric-power average cost as disclosed in Fig. 2 is about 0.9 cent per killowatt-hour, an average utility rate for this class of service. Admittedly there will be some throttling-power loss with constant-speed motors when capacities are reduced. But this also occurs with engine-driven pumps, in spite of claims made otherwise, as many observations disclose.

A study of Fig. 2 for 100 per cent capacity reveals the reason why the engine salesman likes to continue this fiction.

Even individual products pipelines studied whose business has been on the increase from year to year cannot maintain 100 per cent capacity factor. The reason is their greater loads occur in the fall and winter months when pumping fuel and furnace oils, generally resulting in an annual operating-capacity factor of about 80 per cent. The consequent electric-usage factor is 60 to 70 per cent of the installed capability of the motors.

Oil Production

Individual wells can be pumped more economically with engines than with electric motors. This has been shown in the past. But the problem of generating power on the lease or purchasing power is related in a general manner to the pipeline problem as discussed earlier.

Load factor . . . Again the matter of load factor is the important element which has to be resolved, and by load factor we mean the usage of the in-

stalled capacity over the life of the producing field.

Usually the generating plant is sized after flush production is reduced and the wells are placed on pumps. Originally only a few of the wells require pumping, and a plant containing only several generating units is installed. But more generating units are added until after perhaps 2 years the full-size generating plant is completed.

Now depletion of the wells begins to take its toll, and if water intrusion is not too great, the generating plant needs fewer and fewer units as time goes along. Then the producer, in attempting to reduce costs, frantically begins to sell off or use elsewhere the unnecessary units.

To justify generation on the lease, the contention is always made that fuel has no value, that labor is not an item since the plant is operated by men chargeable to the gasoline department, etc.

Electric-cost case . . . However, if you will refer again to Fig. 2 of the previous pipeline discussion, it can be noted that on the engine-cost side you will still have fixed charges, maintenance, and perhaps a little labor. But on the electric-cost side you have only the cost of purchased power, and the costs are computed on each month's demand.

So in the case of constantly decreasing need for electric power the utility is taking the licking, and not the producing oil company which otherwise would have to worry about trying to keep a load on the plant or sell off generating units at the appropriate time.

To illustrate this point Table 3 is shown, and is developed from information obtained from well-known installations in the Mid-Continent area. These generating plants were all installed by large producing oil companies having the best of intentions, and were thought to be potentially of economic merit.

TABLE 3
Utilization of Plant Capacity for Three Generating Plants Installed in Mid-Continent Oil Fields to Pump Oil Wells

(Observed per cent utilization of plant capacity; actual kw.-hr. vs. kw. installed times 8,760 hours)

	2,500 kw.	2,000 kw.	1,400 kw.
End of first year	22	28	87
End of second year	47	60	77
End of third year	32	48	65
End of fourth year	25	38	52
End of fifth year	21	34	49
End of sixth year	19	30	32
End of seventh year	17	25	31
End of eighth year	16	22	26
End of ninth year	15	19	25
End of tenth year	14	16	22
Average per cent usage made of plant capacity in 10 years	23	32	46

TABLE 4—ELECTRIC POWER USAGE BY PETROLEUM REFINERIES

Year	Barrels processed (thousands)	Kw.-hr. consumed (thousands)	Horsepower connected	Kw.-hr. per barrel	Annual kw.-hr. per hp.
1929	930,000	1,653,000	790,000	1.78	2,090
1939	1,237,000	2,772,000	1,159,000	2.24	2,380
1944	1,640,000	5,210,000	2,080,000	3.18	2,500
1954	2,350,000	8,950,000	3,200,000	3.80	2,750

TABLE 5
Ratio of Purchased to Generated Electric Power

Year	Per cent of total kw.-hr. required: Purchased	Generated
1929	50.5	49.5
1939	55.0	45.0
1944	65.0	35.0
1954	75.0	25.0

It can be noted that after 10 years, the capacity required had fallen to very low levels, 14 per cent, 16 per cent, and 22 per cent of the original installation. Also note that during this 10-year period the actual average utilization of the original equipment installed amounted to 23 per cent, 32 per cent, and 46 per cent.

Detailed calculations to show the cost of power generated are deemed unnecessary. It is apparent that in the later years the fixed charges alone would be greater than the cost of purchased power.

Oil Refining

Steam production . . . The problem in the refining business does not involve to any great extent the use of internal-combustion engines. It involves rather the use of back-pressure steam, which enables the production of a killowatt-hour with about 5,000 B.t.u. of fuel chargeable.

However, to achieve this sort of plant economy, the steam production must be balanced with the electric demand. If the electric energy has to be produced condensing, then the refinery costs become practically the same as utility condensing production costs.

The steam requirements of the modern refinery have been gradually becoming smaller through the years with a consequent reduction in capability to produce a low B.t.u.-kw.-hr. Again it might be appropriate to review the history of the refining business to ascertain the changes occurring in the methods applied in modern refining, as disclosed by the U. S. Department of Commerce statistical data.

Purchased-power increase . . . In 25 years the use of electric power has increased 220 per cent (1.78 to 3.8 kw.-hr. per barrel).

The electric-motor horsepower installed has quadrupled during the 25-year period, with an increase in throughput of 250 per cent from 1929 to 1954. From Table 5 note the gradual shift from generated power to purchased electric power.

In 1929 only 50 per cent of the electric requirements were purchased, whereas today about three-fourths of all electric power used in the refining business is purchased. Therefore, it must be obvious that since purchased power is so widely accepted, the matter of competition is overcome.

The records of all manufacturing industries, as disclosed from U. S. Planning and Resources Board (1942), reveal that this change to purchased power is following the same pattern shown for the refining business.

In recent years the use of very large motors has become conventional practice. Hot-oil pumps of 2,000 and 3,000 hp. are not unusual today. Formerly these pumps were driven by steam turbines with back-pressure steam. But the steam balance occurred and then condensing was resorted to, which placed the unit cost of power at the going rate level of supplying utilities. In the case of need for large blower equipment for modern cracking units, sizes 2,500 to 4,000 hp., competition of steam, gas, or dual-fuel engines has been noted.

If the refiner insists on 100 per cent continuity of service, then he has to consider installing standby boiler, or standby engines as the case may be. And then this competitive power source must compete with the lower rate increment of the utility supply. Generally the refiner is already purchasing sizable amounts of electric power through a looped dual-supply automatic - switched

TABLE 6—POWER EQUIPMENT IN ALL MANUFACTURING INDUSTRIES
(Per cent of total horsepower in prime movers and motors)

Year	Using purchased power	Other types of power usage: Hydro	Oil engines	Steam	Total
1929	52.3	4.6	3.5	39.6	47.7
1939	58.2	4.1	3.7	34.0	41.8
1944	72.0	N.A.	N.A.	N.A.	28.0

system of low-voltage lines and dual transportation.

Many studies have revealed the fallacy of attempting to apply mechanical power to the hot-oil charging pumps and/or the air blowers. The payout is generally of the order of 8 to 10 years and therefore considered uneconomic.

Natural-Gas Transmission

Centrifugal compressors . . . The use of electric motors driving centrifugal compressors in gas transmission has not attained very general acceptance for several reasons.

The most important is that the lines are so large, requiring from 10,000 to 15,000 hp. per station, a sizable load for any utility. Then there is the unit cost of electric power, using standard published schedules, which are a little out of line for competitive purposes.

Generally, however, if rate schedules based on size of load are offered to eliminate smaller customers who otherwise might benefit, then the business can be obtained—provided again the expected revenue will justify local investments. In other words, special rates would be desirable for this class of industry.

About the only partially electrified gas-transmission pipeline is the old Big Inch system of parallel 24 and 20-in. lines, with 190,000 hp. of electric motors, and a counterpart 30-in. line with about 40,000 hp. of motors. The total deliverability of these lines is some 935 million cubic feet per day. Total energy usage approaches 1,600,000,000 kw.-hr. annually, with revenues approaching $12,000,000; average cost is about 7 mills per killowatt-hour at near 95 per cent monthly load factor.

The relation of the gas-transmission business to that of products and crude-oil transmission can be illustrated by a recent survey by The Oil and Gas Journal. It indicates a total of 5,827,000 hp. installed, of which about 1,800,000 hp. is for liquid lines, and the balance, 4,000,000 hp. for interstate and intrastate gas transmission.

Their development . . . At the time (1947) the Big Inch system selected electric-motor drive of centrifugal pumps, the gas turbine was not offered for this class of service.

Actually, the idea of using centrifugal compressors dated back to 1931. An experimental unit of 3,000 hp. to six-stage blower was installed in Kansas by Cities Service Gas Co. to gain an increase of 15 per cent in the 20-in. Kansas City line.

From this beginning the Ingersoll-Rand people continued to work on a shaft seal and 15 years later, in 1947, they were able to offer a satisfactory unit. The station spacing, power-supply facility, and good power contracts of the Big Inch system, along with the War Department's insistence of 60-day conversion back to liquids, made the use of centrifugal compressors almost a certainty.

Since this time, steam-turbine centrifugal-compressor stations, gas-turbine centrifugal-compressor stations, and gas-engine centrifugal-compressor stations have been installed and/or contemplated for long interstate transmission lines. All methods have some economic merit.

The sale of 28 regenerative gas-turbine-driving centrifugal compressors of 6,500 r.p.m. to El Paso Natural Gas Co. awakened interest in 1950. But the spade work had already been performed some 5 years previously by the converters of the Big Inch system to centrifugal compressors. It was not due to the application of the prime mover as intimated by one of our large electrical manufacturers.

TABLE 7
(300,000,000 c.f.d., 930 psia., C/R 1.2, 55 miles 24-in., o.d. 10/32-in., 60° F., 0.60 sp. gr., K 1.25, base 14.4 psia., b.hp. 3,000 at 100 per cent capacity)

	Gas engine reciprocating	Centrifugal *compressors			
Method—	compressor	Gas engine	Steam turbine	Gas turbine	Electric motor
Investment ratio	1.0	0.85	1.1	0.72	0.55
Thermal eff. (per cent)	37	37	25	25	
Maintenance ratio	3.5	3.0	2.5	2.0	1.0
Labor ratio	1.8	1.8	1.8	1.5	1.0
Feul (c.f. per b.hp.)	*7.65	†7.1	10.2	10.2	‡0.7

*Adjusted from 6.9 cu. ft. per b.hp.-hr. to include lubrication. †Adjusted from 6.9 cu. ft. per b.hp.-hr. for speed increase gear loss. ‡Cents per kw.-hr.

TABLE 8—OPERATING EXPENSES WITH DIFFERENT TYPES OF STATIONS

	Gas engine reciprocating	Centrifugal compressors			
Expense item—	compressor	Gas engine	Steam turbine	Gas turbine	Electric motor
Fixed charges	$128,000	$109,000	$140,000	$92,500	$70,500
Maintenance	25,200	21,600	18,000	14,400	7,200
Labor	39,400	39,400	39,400	32,700	21,800
Fuel	35,300	32,800	47,200	47,200	103,000
Total	$227,900	$202,800	$244,600	$186,800	$202,500

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The competitive problem in the case of gas transmission is much more involved and difficult to solve than is the case of liquid transmission. The load factor or capacity factor of the long interstate gas line is much higher than generally achieved by crude or products lines. This is because underground storage reservoirs make possible annual capacity factors of about 90 per cent.

Which to use? . . . To illustrate relation in original investments, thermal efficiency of the prime movers and annual operating expenses of the five types of stations, Table 7 is shown.

By substituting reasonable values of construction costs, maintenance values, operating labor costs, and fuel costs based on salable value at terminus, the dollar values shown in Table 8 are determined. They are for the situation of 90 per cent capacity factor or pumping an average of 270,000,000 cu. ft. per day, compression ratio of 1.15 requiring an average of 2,100 b.hp. on the prime movers.

From the above summation, it can be noted that there is not much choice between any of the methods proposed, except the use of steam power which seems rather high by comparison.

If electric power could be purchased for an average of 0.6 cent per killowatt-hour, the electric motor would readily compete with the regenerative gas-turbine drive. Actually, the gas turbine in the example used would require smaller units than are now being manufactured in quantity. That would mean that the gas-engine-driven centrifugal compressor would most likely be considered for sparsely settled territories. See Fig. 3 for comparative dollar values.

Again it is obvious that if this selection of most economic prime mover is given to a group of engineers, many answers would be received.

How oil volatility and additives affect . . .

ENGINE OCTANE REQUIREMENT

". . . the lubricant can play a large part in reducing octane requirement whether or not engine is spark-knock or surface-ignition limited."

by F. S. Wood and C. C. Colyer

THE octane requirement of an engine, to suppress either spark knock or audible surface ignition, is influenced greatly by the motor oil used. Each component of the motor oil contributes. The volatility of the base oil, the organic portions of detergents and oxidation inhibitors, and the type of viscosity-index improver—all have a direct bearing on the requirement.

Multigraded oils are not necessarily more effective in reducing octane requirements than single-graded oils; much depends on the base oil and v.i. improver. Generally, effects of components are algebraically additive.

A modified detergent with a specific v.i. improver reduces both spark knock and surface ignition. With proper selection of lubricant, engines that are surface-ignition limited can be made spark-knock limited. In field tests, although higher-speed commuter driving reduced the requirement level, benefits of the modified detergent were equivalent under both city and commuter driving.

Expressed in performance numbers, benefits observed in the field were similar to those observed in the laboratory regardless of differences in engine design, compression ratio, and engine operation.

Deposits . . . The role of combustion-chamber deposits in determining the octane-number requirement of a gasoline engine becomes increasingly important as compression ratios rise. The deposits fill a larger portion of the compressible volume of the combustion chamber; also their effect on heat transfer becomes more pronounced as combustion temperatures increase. In some cases, these deposits may increase the requirement as much as ten numbers.

Petroleum and automotive industries are spending much time and money trying to reduce knocking caused by combustion-chamber deposits. Much of the harmful deposit-forming tendencies of motor oils have been long attributed to the higher-boiling fractions of the base oil.[1,2] Bright stocks particularly have been found to increase octane requirement.[3,4,5] Volatility, however, seemed to be the controlling factor regardless of the source of the crude.[3,4,6,7] Where differences could be discerned, motor-oil additives appeared to increase octane requirement.[4,5]

To further understand how oils affect combustion-chamber deposits, various lubricant components have been evaluated in terms of the octane number required to suppress spark knock and the octane number required to suppress surface ignition. The influences of base-oil velocity, detergent-inhibitor type, and viscosity-index-im-

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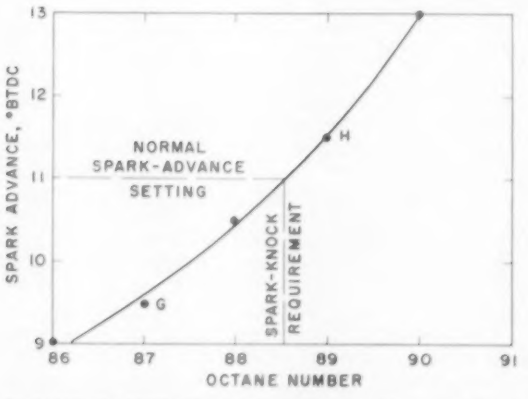
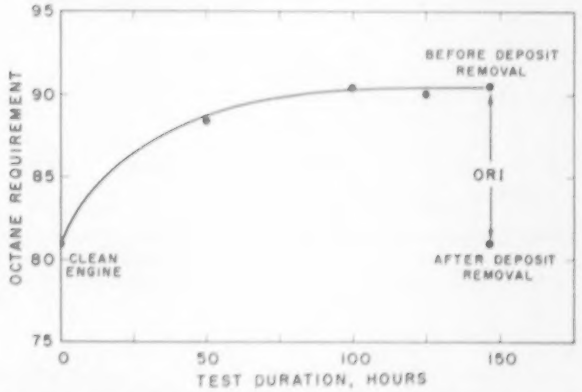


OCTANE REQUIREMENT for engines, either spark-knock (G) or surface-ignition limited (H). Fig. 1.

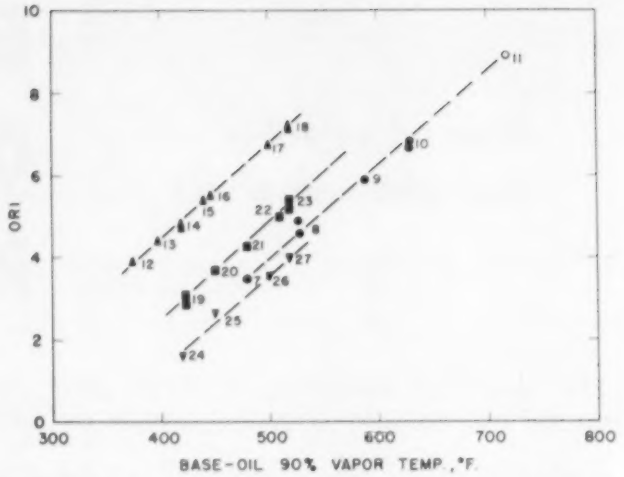


SPARK-KNOCK REQUIREMENTS before and after engine deposits are removed are subtracted to get octane-requirement increases (o.r.i.) Fig. 2.

prover type were studied in laboratory engine tests. The results were verified in controlled field tests.

Others have reported that greater differences can be discerned between oils when a relatively nondeposit-forming single-component fuel like unleaded isooctane is used.[3,4,5] We felt that our results would be more realistic if leaded commercial fuels were used.

Comparing lubricants . . . Octane-requirement increase (o.r.i.) was chosen as the basis for comparing lubricants. Excellent reproducibility between engines regardless of the equilibrium octane requirement and the possibility of applying the results to other engines were the major advantages of this basis.



TESTED OILS are compared on the basis of octane-requirement increases. Fig. 3.

Determination of Octane-Requirement Increase

Over 30 oils of different composition were used. For the most part, they were Mid-Continent solvent-extracted distillates of differing volatility. Properties, composition, and test results are tabulated in Tables 1, 2, and 3. A key to the oils used is illustrated in Fig. 3.

For our laboratory evaluations, overhead-valve V-8 Oldsmobile engines were used having compression-ratios of 8:1 and displacements of 304 cu. in. They were run under cyclic 30-miles-per-hour road-load conditions on a fuel that contained 2.7 cc. TEL per gallon. A detailed description of the test procedure is given as well as properties of the test fuel.

Spark knock . . . The spark-knock requirement of each engine was determined by increasing the spark advance at full throttle and constant speed until light knock occurred. As shown in Fig. 1, this procedure was repeated with primary-reference fuels of different octane number until a smooth curve could be drawn.

The spark-knock octane requirement was then obtained from the curve at the normal spark-advance setting recommended by the engine manufacturer.

The surface-ignition requirement was determined by a similar technique. Whenever knocking occurred, the spark advance was retarded 5°. If knocking continued, the noise was deemed to be caused by surface ignition.[9] Besides giving a characteristically different sound than spark knock, audible surface ignition developed gradually; first incipiently with the higher-octane fuels, then more intensely as the octane number of the fuel was lowered.

The surface-ignition octane requirement of the engine was the highest octane number at which surface ignition occurred.

Surface ignition . . . As seen in Fig. 1, if surface ignition was heard at point G, at an octane number lower than the spark-knock requirement, the engine was spark-knock limited. If surface ignition was heard at point H, at an octane number higher than the spark-knock requirement, the engine was surface-ignition limited.

The initial requirement obtained with new or reassembled engines was unreliable, probably because of variations in valve seating. Therefore, prior

TABLE I—OILS TESTED

	Commercial oils						Oils without v.i. improver				
Oil number—	1	2	3	4	5	6	7	8	9	10	11
S.A.E. grade	10W-30	20	10W-30	10W-30	10W-30	20	10	20	30	40	20
Viscosity, S.U.s.:											
0° F.	12,000	38,000	9,000	10,000	10,000	25,000	11,500	36,000	88,000	200,000	26,000
100° F.	322	379	346	303	325	347	188	379	590	987	359
210° F.	62.1	57.1	69.3	61.6	64.2	57.1	45.7	57.1	67.0	84.9	58.0
V.I.	135	99	143	138	139	109	99	98	92	90	110
Base-oil volatility (1 mm. Hg. abs.):											
10 per cent	*351	*404	*365	*367	*339	*336	377	404	421	445	315
50 per cent	435	480	451	445	426	456	410	454	514	540	450
90 per cent	509	528	548	520	644	720	480	528	590	630	720
V.I. improver, volume per cent	B	None	A and B	A	A	None	None	None	None	None	None
Additive, metals, weight per cent:											
P	0.065	0.043	0.15	0.122	0.10	0.017	0.068	0.068	0.068	0.068	0.068
Ba	0.18	0.013	0.50	0.60	0.10	.....	0.18	0.18	0.18	0.18	0.18
Ca	.....	.....	0.075	.....	0.80	.....	.....	.....	.....	.....	.....
Zn	.....	.....	0.03	.015	0.03	.....	.....	.....	.....	.....	.....
O.r.i.:											
Spark-knock	3.5	5.0	7.0	7.5	8.5	9.5	3.5	4.9	5.9	6.7	8.9
Surface ignition	.....	.....	.....	.....	.....	.....	.....	4.6	.....	6.8	.....

*Finished oil.

TABLE 2—OILS TESTED

Oil number—	Oils with v.i. improver A							Oils with v.i. improver B				
	12 (K)	13	14	15	16 (J)	17 (X)	18	19	20 (Y)	21	22	23
S.A.E. grade	5W-20	5W-20	5W-20	5W-20	5W-20	10W-30	20W-40	10W-20	10W-30	20W-30	20W-30	20W-40
Viscosity, S.U.s.:												
0° F.	2,600	3,100	2,800	3,500	3,000	10,500	23,000	6,500	11,000	15,000	15,000	42,000
100° F.	152	171	168	189	160	316	508	247	318	353	340	576
210° F.	49.2	51.4	51.6	54.3	49.9	62.0	785.	57.1	62.0	62.3	61.3	75.0
V.i.	160	156	158	157	157	136	132	143	136	128	128	117
Base-oil volatility (1 mm. Hg. abs.):												
10 per cent	322	366	319	317	317	317	412	328	329	377	355	412
50 per cent	340	375	351	376	372	433	470	366	384	410	423	470
90 per cent	375	398	420	440	446	500	520	422	450	480	510	520
V.i. improved, vol. per cent	4.4A	5.4A	4.4A	5.4A	4.4A	4.4A	4.4A	10.5B	10.5B	7.8B	7.8B	7.8B
Additive, metals, wt. per cent:												
P	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Ba	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18
Ca	...	...	...	...	...	...	...	...	...	...	...	...
Zn	...	...	...	...	...	...	...	...	...	...	...	...
O.r.i.:												
Spark-knock	3.9	4.4	4.8 4.7	5.4	5.5	6.6	7.1 7.2	3.1 2.9	3.7	4.3	5.0	5.2 5.3 5.4
Surface ignition	<0	0	...	3	3	8	9	0 1	0	...	5	7 8 8

TABLE 3—OILS TESTED

Oil number—	Oils with modified detergent and v.i. improver A				S-1 level oils with v.i. improver A		
	24 (L)	25	26 (Z)	27	28 (W')	*29 (X')	*30 (Z')
S.A.E. grade	5W-20	10W-30	10W-30	20W-40	10W-30	10W-30	10W-30
Viscosity, S.U.s.:							
0° F.	2,600	5,100	10,500	20,000	10,000	10,000	10,000
100° F.	169	242	316	510	319	318	318
210° F.	52.1	59.2	62.0	78.8	62.7	62.7	62.7
V.i.	160	150	136	132	137	137	137
Base-oil volatility (1 mm. Hg. abs.):							
10 per cent	319	350	371	412	318	371	371
50 per cent	351	391	423	470	378	423	423
90 per cent	420	450	500	520	552	500	500
V.i. improver, volume per cent	4.4A	4.4A	4.4A	4.4A	5.4A	4.4A	4.4A
Additive, metals, weight per cent:							
P	0.068	0.068	0.068	0.068	0.19	0.19	0.19
Ba	0.18	0.18	0.18	0.18	0.53	0.53	0.53
Ca	...	...	...	...	...	...	...
Zn	...	...	...	...	0.13	0.13	0.13
O.r.i.:							
Spark-knock	1.6	2.7	3.5	4.0	9.1	6.8	3.8
Surface ignition	<0	<0	2	4	12	8	4

*Field test oils.

to the start of each test, the engine was run for 24 hours on a reference oil to properly seat the valves and condition the engine.

Combustion-chamber deposits were then removed, and the clean requirement was determined. The procedure was repeated until a consistent clean requirement was obtained.

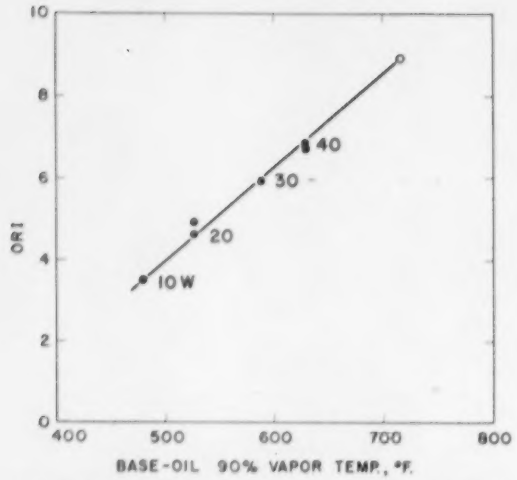
As shown in Fig. 2, the engine was then run on the test oil until the spark-knock octane requirement reached equilibrium. Combustion-chamber deposits were again removed, and the octane requirement was again determined. Spark-knock o.r.i. is the difference between the requirement before and after deposit removal.

The requirement after removal of combustion-chamber deposits should always duplicate the clean requirement. If it does not, either the mechanical condition of the engine has changed, or deposits other than those in the combustion chamber are contributing. Results from such abnormal tests were discarded.

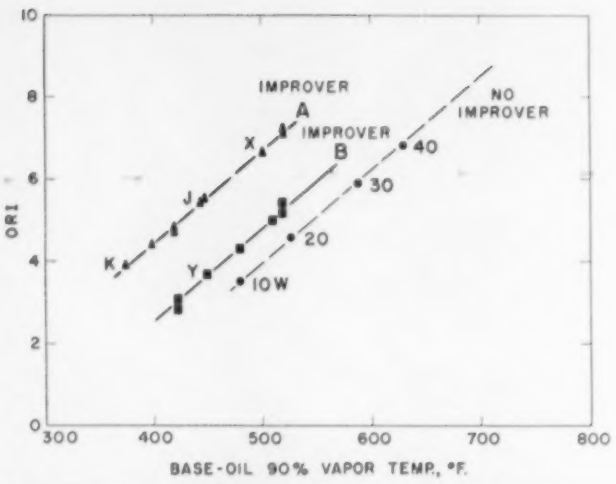
Surface-ignition o.r.i. is the difference between the surface-ignition requirement before deposit removal and the clean-engine spark-knock requirement after deposit removal. Results were corrected for temperature, humidity, and barometric pressure.

Reproducibility . . . In repeated tests although the equilibrium requirement varied as much as 4 numbers between engines, reproducibility of spark-knock o.r.i. was within 0.3 numbers in one comparison, 0.2 in two other comparisons, and 0.1 in five other comparisons. Surface-ignition o.r.i., measured in whole octane numbers, reproduced within 2 numbers.

To determine how well such a technique with leaded fuel would differentiate between commercial oils, four



OIL VOLATILITY decreases the o.r.i. due to engine deposits. These are typical Mid-Continent solvent-extracted distillate oils. Fig. 4.



VISCOSITY-INDEX IMPROVERS increase octane requirement. Lines for improved and nonimproved oils are parallel showing equal influence of volatility. Fig. 5.

10W-30-grade and two 20-grade oils were tested. Oils of like grades showed a considerable spread in o.r.i.:

Oil grade—	Spark-knock o.r.i.
10W-30	3.5
20	5.0
10W-30	7.0
10W-30	7.5
10W-30	8.5
20	9.5

The spread was 5 units between the 10W-30 oils and 4.5 units between the 20-grade oils. Evidently multigraded oils do not reduce o.r.i. simply by virtue of being multigraded; the components undoubtedly are more important.

Spark-Knock Octane-Requirements Increase

Effect of volatility was determined with base oils of different volatility, all containing the same detergent and inhibitor. Effect of detergent and inhibitor was studied in common base oils. Effect of v.i.-improver was investigated with different base oil containing the same detergent and inhibitor.

Base-oil volatility . . . Oil volatility was measured in terms of the vapor temperature at which 90 per cent of the oil was distilled under 1 mm. mercury absolute pressure.[10] Four oils, 10W, 20, 30, and 40, were typical Mid-Continent solvent-extracted distillate oils. The fifth, a 20-grade oil, was made from an extremely wide cut of a highly paraffinic distillate. All of the oils were single-graded and contained the same detergent and imhibitor in amounts necessary to meet M.I.L. requirements.

The effect of oil volatility on engine o.r.i. is shown in Fig. 4. O.r.i. increases linearly as the 90 per cent temperature increases, approximately one unit for every 45° F. The octane requirement with the 10W oil is about one unit less than that of the 20, two units less than that of the 30, and three units less than that of the 40 oil.

The open point for the wide-cut oil agrees well with the points for the Mid-Continent oils; however, the difference between the typical 20 and the wide-cut 20 is four and a half units. Thus, in selecting a base stock, the volatility as well as the viscosity must be considered.

Detergent-inhibitor . . . Detergents and oxidation inhibtors are generally used in passenger-car motor oils in concentrations of 0.5 per cent to about 10 per cent, depending on the effectiveness of the additives and the performance desired.

The concentrations used in this study were equivalent to those normally employed in many motor oils. The effective dosage was measured by the content of the metal in the oil:

INHIBITOR CONCENTRATION

Additive—	Metal in oil, per cent	Effect on o.r.i.
Barium P_2S_5-olefin	0.17	−0.5
Barium P_2S_5-olefin	0.53	−0.5
Barium phenate	0.53	+0.5
Barium sulfonate	0.071	+1.0
Calcium sulfonate	0.027	+1.0
Zinc dithiophosphate	0.11	0
Sulfurized olefin	0.0	0

The barium P_2S_5-olefin detergents reduced o.r.i., whereas the phenate and sulfonate detergents increased it. The zinc dithiophosphate and sulfurized-olefin inhibitors, on the other hand, showed no effect. The organic portion of the molecule affects o.r.i. far more than the type or amount of metal present.

The numerical effect on o.r.i. of combining detergents and inhibitors is algebraically additive. For example, the combined effect of the barium P_2S_5-olefin detergent and zinc dithiophosphate inhibitor decreased the o.r.i. of the finished oil by 0.5 unit. The addition of calcium sulfonate to this blend contributes an increase of one o.r.i. unit, but the net result was an increase of only 0.5 unit. Thus, it is easy to select additive combinations that have low o.r.i. properties when the effects of individual components are known.

V.i.-improver . . . Two widely used types of v.i. improvers were evaluated. Both were used in blending multigraded oils from various Mid-Continent solvent-extracted distillate base stocks. The barium P_2S_5-olefin detergent and the sulfurized olefin inhibitor were used in all blends, as in the base-oil volatility study.

Fig. 5 compares the o.r.i. results obtained with these v.i.-improved multigrade oils with those of the non-v.i.-improved single-graded oil. For any given base oil, both improvers increase octane requirement. The lines for the improved oils and the nonimproved oils were found to be parallel. Thus, each is equally influenced by the volatility of the base oil.

Base oils . . . In making multigrade oils, however, each type of polymer requires significantly different base oils. Because of the greater thickening properties of improver B, a less-viscous and hence more-volatile base oil is used.

Shown as point X and Y are two 10W-30 oils made with v.i. improvers A and B. The o.r.i. difference between

these oils is 3 units—2 units attributable to the v.i. improvers; 1 unit, to base-oil volatility.

Oil X has an o.r.i. about 1 unit higher than that of a 30-grade oil and 2 units higher than a 20-grade oil. Oil Y, on the other hand, is 2 units better than a 30-grade oil and 1 unit better than a 20-grade oil.

Multigraded oils, therefore, are not necessarily more effective in reducing o.r.i. than single-graded oils. Much depends on how they are blended.

Improver A is widely employed in the manufacture of 5W-20 oils because more-viscous and less-volatile base stocks are used. Such an oil, represented by point J, has an o.r.i. greater than a 20-grade oil and greater than 10W-30 oil Y.

If the normal volatility spread (90-10 per cent) of the base oil is narrowed from 130° to 50°F. by narrow cutting, an equivalent viscosity 5W-20 oil results. However, this oil, represented by point K, has an o.r.i. almost equal to that of 10W-30 oil Y, 1 unit lower than the 20-grade oil, and 1.5 units lower than 5W-20 oil J.

Thus, multigrade oils can offer major advantages in reducing octane requirement provided the proper v.i. improver and boiling range of base stocks are selected.

Modified detergent . . . The type of combustion-chamber deposits formed with oils blended with improver A were found to differ from those formed with oils blended with improver B. The deposits with improver A formed a relatively smooth, adherent, continuous film. The deposits with improver B were granular and more graphitic in nature and provided a discontinuous surface.

Adherent continuous films would be expected to have higher thermo-insulating properties. Such properties are in line with the higher octane requirement found with improver A. These observations agree with others that continuous films lead to higher octane requirements. [4 11]

Efforts to modify combustion-chamber deposits have led to the development of gasoline additives to reduce surface ignition. Because surface ignition is often spark-knock induced, and because a greater reduction in spark-knock octane requirement seems possible by varying lubricating-oil properties than by varying fuel properties, the present study concentrated on modifying combustion-chamber deposits by means of lubricating-oil additives.

A modified detergent of the barium P_2S_5-olefin type was developed and proved suitable for such use. Apparently it reduced octane requirement in two ways: (1) by changing the physical form of the deposits so that they are more granular and more easily scavenged, and (2) by increasing the lead to carbon ratio of the deposits so as to increase the coefficient of heat transfer.

Analysis of the combustion-chamber deposits indicate that although the weight and concentration of lead increases only slightly, the weight and concentration of carbon is reduced 50 per cent.

As can be seen in Fig. 6, the use of the modified detergent in 10W-30 oils made with improver A reduced spark-knock o.r.i. 3 units. Oil Z made with improver A and the modified detergent is equal to oil Y made with improver B and 3 units better than oil X also made with improver A.

Oil L, a 5W-20 blend made with a cheaper wider-cut base oil than K, is 2.5 units better than K and 2.0 units better than 10W-30 oil Y.

Oil L has the lowest o.r.i. of any oil ever tested in our laboratory with leaded fuel.

The modified detergent was not found to be effective in further reducing the octane requirement of either the oils made with improver B or the non-v.i. improved oils. It was effective only with improver A.

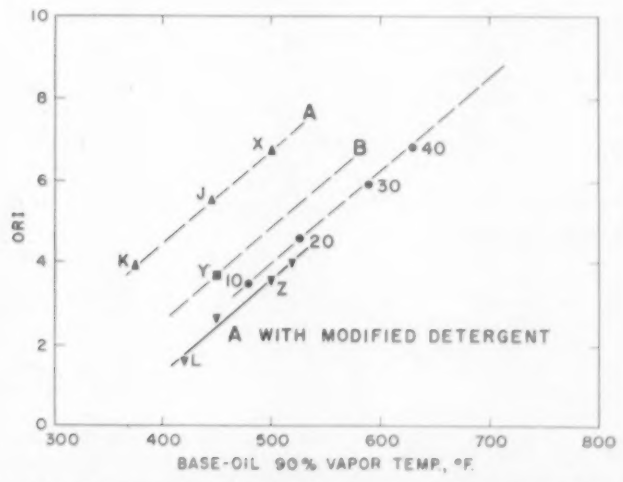
In order to determine the effectiveness of this modified detergent at higher concentrations, S-1 level 10W-30 oils X′ and Z′ were blended using a zinc dithiophosphate inhibitor. An additional S-1 10W-30 oil W′ was blended with bright stock to show the effect of volatility. All three were made to the same viscosity and v.i. with improver A.

Oil	Base oil	Ba P_xS_x-Olefin Detergent	o.r.i
W′	Bright stock, distillate	Regular	9.0
X′	Distillate	Regular	7.0
Z′	Distillate	Modified	4.0

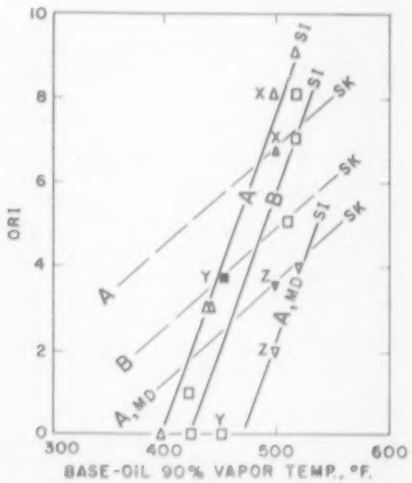
Thus, a 2 o.r.i. improvement can be gained by omitting the bright stock and making the oil more volatile, yet an even greater improvement can be obtained by means of the modified detergent. The 3 o.r.i. benefit found here with the modified detergent at the S-1 level is the same as that found at the lower M.I.L. level with sulfurized olefin as the inhibitor.

Surface-Ignition Octane-Requirement Increase

Surface ignition is affected by the same motor-oil qualities that affect spark knock, but only in different proportions. In Fig. 7 both surface-ignition o.r.i. and spark-knock o.r.i. obtained with the v.i.-improved oils are



MODIFIED DETERGENT used with viscosity-index improver A reduces octane requirement due to engine deposits. The detergent was not effective with improver B or nonimproved oils. Fig. 6.



EFFECT OF MOTOR OILS on o.r.i. of surface-ignition and spark-knock-limited engines. Fig. 7.

plotted against the base-oil 90 per cent vapor temperature.

Whereas the octane required to suppress spark knock increased one number for every 45°F. increase in base-oil temperature, the octane required to suppress audible surface ignition increased one number for every 15°F. As the harmful effects of the deposits cause an increase in spark-knock o.r.i., apparently the tendency of deposits to glow and cause surface ignition increases at an even greater rate.

When the spark-knock and surface-ignition lines cross, the engine becomes surface-ignition limited rather than spark-knock limited. With 10W-30 oil X made with improver A, the engine was surface ignition limited. On the other hand, with 10W-30 oil Y made with improver B, the engine was spark-knock limited.

The modified detergent in 10W-30 oil Z reduced the surface-ignition requirement of 10W-30 oil X as much as 6 units so that with Z the engine became spark-knock limited.

Relationship . . . Thus, in this engine there is a definite relationship between spark knock and surface ignition. The octane required to suppress both can be reduced by lowering the base oil 90 per cent vapor temperature and, in oils containing improver A, by the use of the modified detergent.

Consequently, some engines that are surface-ignition limited can be made to be spark-knock limited by the proper selection of the lubricant. To date the popular deposit modifiers used in the fuel appear to suppress audible surface ignition by reducing either the severity or the frequency of surface ignition. When used in an engine which is surface-ignition limited, however, apparently the engine remains surface-ignition limited rather than becoming spark-knock limited.

Thus, octane requirement is not significantly reduced as is the case with the proper selection of lubricant.

Field Tests

To confirm the laboratory findings, field tests were run on the two 10W-30 S-1 level oils X′ and Z′ made with v.i. improver A. Oil X′ contained the regular barium P_2S_5-olefin detergent, whereas oil Z′ contained the modified barium P_2S_5-olefin detergent. The tests were conducted by the Southwest Research Institute in Cadillacs having compression ratios of 9.75:1 and displacements of 365 inches.

The tests were run under conditions simulating commuter and city driving. Commuter driving included 10 per cent at 50-55 m.p.h., 25 per cent at 30-45 m.p.h. and 65 per cent stop-and-go driving below 30 m.p.h. City driving consisted of 35 per cent at 30-45 m.p.h. and 65 per cent stop-and-go driving below 30 m.p.h.

Details of the test procedures are presented below. The leaded gasoline used had a higher aromatic content than the laboratory test fuel. Again a consistent clean requirement was obtained before each test. The engines were then run until their requirements reached equilibrium.

Modified detergent . . . Both types of service confirmed the laboratory findings that the modified detergent reduced spark-knock o.r.i.:

Detergent	City	Commuter
Regular	4.5	3.0
Modified	3.0	1.5
Δ o.r.i.	1.5	1.5

Although the o.r.i. level was lowered by the 10 per cent of higher-speed driving of the commuter service, the 1.5 o.r.i. benefit remained the same for both types of service.

The benefit of the modified detergent, measured in terms of octane numbers, was less in the field than observed in the laboratory. However, octane level accounted for most of the difference. The 9.75:1 compression-ratio engines required gasoline of considerably higher octane number than did the 8:1 compression-ratio engines.

Expressed in performance numbers the benefits were quite similar regardless of differences in engine design, compression ratios, or engine operation [12 13]:

	Laboratory	Field 9.75:1	
Detergent	8:1	City	Commuter
Regular	8.6	10.1	6.5
Modified	5.3	6.5	3.1
Δ Performance-number-requirement increase	3.3	3.6	3.4

In the laboratory with primary reference fuels, oil X′ without the modified detergent was surface-ignition limited. In the field test with full-boiling-range reference fuels, it was intermittently surface-ignition limited. Oil Z′ with the modified detergent was wholly spark-knock limited confirming the laboratory findings.

Thus the lubricant can play a large part in reducing the octane requirement of an engine regardless of whether the engine is spark-knock or surface-ignition limited.

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. . . of your industry. You can depend on the Journal to bring you the right picture of current trends in the oil and gas business in—Current Statistics—a weekly feature.

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Acknowledgment

The authors wish to acknowledge the contributions of D. J. Groetch, L. D. LaCroix, and R. W. Boydston to the present study.

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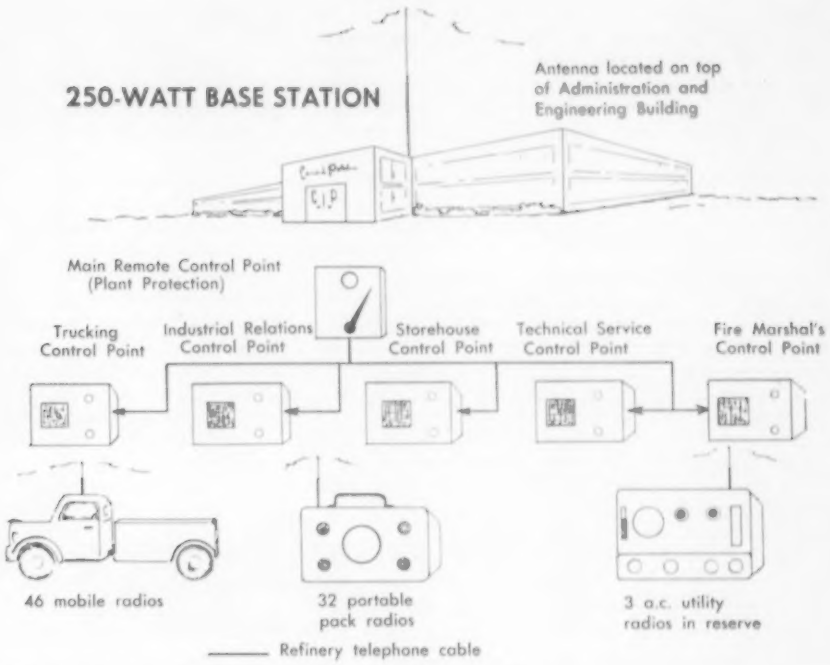
Flexibility, mobility, and wide area coverage—these are reasons why . . .


250-WATT BASE STATION
Antenna located on top of Administration and Engineering Building
Main Remote Control Point (Plant Protection)
Trucking Control Point
Industrial Relations Control Point
Storehouse Control Point
Technical Service Control Point
Fire Marshal's Control Point
46 mobile radios
32 portable pack radios
3 a.c. utility radios in reserve
Refinery telephone cable

FUNCTIONAL DIAGRAM of the two-way-radio system. Fig. 1.

Two-Way Radio Is Star Performer

by L. F. Stanley and E. C. Williams

ONE of the more attractive cost-reduction systems introduced by the materials handling committee at Standard Oil Co.'s Whiting refinery is the two-way radio system.

In a huge sprawling refinery encompassing some 1,900 acres extensively subdivided by main highways, numerous secondary public and company roads, five main-line railroads, and some 52 miles of company trackage, communications are of major importance. Communications are provided by a Bell Telephone system, a private telephone system, a plant mail service, a messenger and delivery service, localized whistle call systems, and the radio system.

The radio system augments the other communication systems by providing flexibility, mobility, and wide area coverage. The system has grown continuously, and preliminary plans call for stepwise increases to approximately 80 vehicular radios.

Description of System

The two-way F.M. radio system outlined in Table 1 operates on a frequency of 153.23 megacycles.

TABLE 1—SUMMARY OF RADIO TYPES BY TRANSMITTER OUTPUT

No. of radios	Description
1	250-watt base station with six remote control units
1	50-watt mobile unit
1	30-watt mobile unit
17	25-watt mobile units
3	25-watt a.c. utility units
26	10-watt mobile units
1	3-watt mobile unit (low-power industrial type)
32	Portable pack sets (less than 1-watt output)
—	
82	

The base station, shown functionally in Fig. 1, is located in the administration and engineering building several blocks from the refinery, and the antenna is located on top of this building, approximately 120 ft. above ground level. The remote-control units scattered throughout the refinery actuate the base station through designated pairs in the refinery telephone cables.

As required by Federal Communications Commission regulations, one remote control point monitors the base station and can disconnect the other control points, if necessary. Three 25-watt a.c. utility radios are kept in reserve for use in the event of emergency failure of the base station or any remote-control units.

When the system was first placed in operation in December 1950, the 10-watt unit was the standard mobile installation. Today, 25-watt units are standard equipment, and two of the units are even larger. More reliable communications over greater distances, available at reasonable costs in the more powerful units, induced this change.

An exception to this trend towards more powerful units is the 3-watt low-power industrial radio. This recent installation required a radio suitable for operation on the 32-volt d.c. electrical system of a locomotive crane. A converter satisfactorily supplies 117 volts a.c. to this radio. Because the crane operates within the refinery, the 3-watt output has been entirely satisfactory.

Communications good . . . Consistent, high-quality, two-way communications are maintained between the base station and the mobile radios for dis-

Authors are with Standard Oil Co. (Ind.), Whiting, Ind. Paper presented at Petroleum Electrical Conference, A.I.E.E., Kansas City.

tances averaging 18 miles. This distance is affected, of course, by the power output of the mobile transmitter, terrain, and structural congestion between the radios in question. Communications between mobile radios are limited, in general, to a distance of 2 to 3 miles. Roof-top antennas are used with all mobile radios.

Economic Incentives

Most of Whiting's two-way radios are used for materials handling, the original basis for installing the entire system. Thirty-four vehicles in Table 2, Group A, Handling Equipment, and five vehicles in Group B, Special Assignment Vehicles, or about 85 per cent of the 46 radio-equipped vehicles, are in direct materials-handling service. More efficient handling through better communications is still the primary reason for using the refinery radio system.

Group B vehicles differ from Group A vehicles in that their highly specialized assignments require dispatching through other than the trucking department.

Routine savings through radio use are derived from:

1. Direct saving in driver time which increases production.

2. Reduction of contingent delays affecting associated equipment, supplies, and personnel, particularly in outlying construction areas lacking other communications.

3. Prompt reporting and repair of equipment breakdowns.

4. Expediting supplies and emergency repairs affecting costly processing unit operations and down time.

5. Reduction of mobile equipment fleet through increased production.

General cost data . . . The investment in mobile radio equipment is not large, as Table 3 shows. All costs include installation but neglect overhead.

TABLE 3

Type—	Approx. cost
25-watt radio utilizing vehicle generator	$510.00
25-watt radio utilizing high-output, low-cut-in generator	695.00
¼ and ⅜-watt pack sets with batteries (obsolete)	380.00
5-watt pack sets with batteries	500.00
External power supply for pack sets	75.00

The investment in base station equipment varies quite widely depending upon the installation. Complex installations are quite expensive. For example, our 250-watt base station and four remote-control points cost about $3,900 installed.

Monthly maintenance costs average about $4.50 per unit, based upon 1955 parts and labor service charges for the base station, remote-control points, and vehicular radios. This work is contracted locally. Both leasing equipment and fixed-charge maintenance plans have been considered at various times, but none have approximated the present low maintenance costs.

With a smaller installation, the monthly maintenance cost approached $8.00. Presumably, combining service calls and removing radios from rough scooter service caused the lower costs. Pack-set data are lacking because of our currently limited experience.

Operating costs are neglected because vehicle drivers, dispatchers, and similar personnel operate the radios. Approximately 175 calls are currently made during the day shift. A few calls are also made during the night shifts.

Justification

The analyses which lead to most of the radio installations indicated that the investment costs would be paid back through cost reductions within 1 year. The average estimated payout period was about 6 months.

The payout-period calculation is a simple method used to screen small projects. Essentially, the method advises management how quickly moneys invested in a project will be returned and made available for other uses. Obviously, the limited supply of money necessitates placing it in only the most attractive projects.

The method includes the general effects of capital investment, expense items, annual savings, capital tax, and depreciation. However, delayed invest-

5 MINUTES ON BETTER MANAGEMENT

Communicators Classified . . .

Do you recognize these birds?

FOUR-FIFTHS of our working day, it has been estimated, we're communicating—trying to understand someone or trying to make him understand us. Unfortunately, much of this effort is rendered ineffective by the strange habits of some communicators.

Here is an exhibit of bottlenecks and plugged pipelines in the communications system of industry. Strange people, and not at all like us—but still people. With patience and good will (and lifelong study) we can perhaps learn to understand them and to cope with their peculiarities.

Jolly Good Fellow . . . Talks golf, relatives, and the bright sayings of children. As you leave, he says casually: "By the way, your unit is being transferred to Alaska."

Great Stone Face . . . He smiles not, neither does he frown. Some years ago he hit on the only correct facial expression, and he isn't going to disarrange it just for you. There's a legend that he sneezed once, but that was before he came to this company.

Roller-Coaster . . . Sometimes he's up, sometimes he's down . . . If you want to stay with him, fasten your seat belt.

Disk Jockey . . . Stuck tight in the groove. You'd like to change the record? Hands off, brother! That's not the way we do things around here.

Cat on a Hot Tin Roof . . . He'd stay on the subject if his twitch would let him. The poor fellow **may** be grateful if you lift him gently on the track.

Poor Man's Freud . . . Now what did **that** really signify? He's so intrigued by your unconscious meaning that he has no attention to spare for what your're saying.

ment effects are ignored. Using the method only for small projects with short-term payout periods minimizes this disability. The formula is:

$$P = \frac{C + E(1 - T)}{S - T(S - CD)}$$

Where:

P = payout period in years
C = total capital costs of project in dollars
E = total expense costs of project in dollars
S = total annual savings in dollars
T = capital tax rate in per cent/100
D = depreciation rate in per cent/100

An example of this calculation is the Chicago trip truck used daily in pickup service at many points within approximately a 20-mile radius of the refinery. About $240 is saved monthly through contacting this vehicle in transit to expedite parts and material deliveries which reduce down time on processing units and mobile equipment. Deducting the $54 annual maintenance cost from the estimated saving, we find the annual savings are $2,826.

Certain factors remaining constant in most calculations are:

E = 0.0—normally no expense items such as dismantling.

T = 0.5—rounding off the 52 per cent capital tax rate applying to large corporations.

D = 0.1—assuming a uniform depreciation rate over an estimated 10-year life. (The rapid obsolescence of radio equipment makes this assumption appear conservative.)

TABLE 2 — SUMMARY OF RADIO-EQUIPPED VEHICLES AND PORTABLE RADIOS

Description—	No. of radios
A. Handling equipment:	
1. Pickup trucks	5
2. Six-wheel dump trucks	3
3. Traveloaders	4
4. Straddle carriers	3
5. Dempster dumpster trucks	3
6. Panel trucks	2
7. A-frame trucks	2
8. Hydralift trucks	2
9. Large fork-lift trucks	2
10. Utility line trucks	2
11. Pettibone speed swing	1
12. Fuel-delivery truck	1
13. Four-wheel dump truck	1
14. Stake-body truck with hydraulic tailgate	1
15. 50-80-ton locomotive crane	1
16. Austin Western hydraulic crane	1
17. Engineering bus	1
	35
B. Special assignment vehicles:	
1. Fire-protection department:	
(a) Fire chief's car	1
(b) Pickup trucks	2
(c) Fire truck (pumper)	1
	4
2. Industrial-relations department:	
(a) Nurses' cars	2
3. Plant-protection department:	
(a) Station-wagon prowl car	1
4. Technical service department:	
(a) Laboratory sample (pick-up) trucks	3
(b) Air-pollution-control station wagon	1
	4
C. Battery or converter-powered portable sets:	
1. ½-watt pack sets	12
2. ¼-watt pack sets	20
	32
Vehicle total	46
Grand total	78

In summary we have: C = $510; S = $2,826; E = 0.0; D = 0.1; T = 0.5

Substituting:

$$P = \frac{C + E(1 - T)}{S - T(S - CD)}$$

$$= \frac{510}{2,826 - 0.5\,[2,826 - (0.1 \times 510)]}$$

$$P = \frac{510}{1,438.50}$$

= 0.354 years or 4.25 months

Except for annual savings, data applying to this calculation can be accurately determined. Therefore, the entire justification rests upon the accuracy of estimating annual savings.

Mr. Split Alternative . . . We've gotta get going on these plans. Not a minute to lose. But—on the other hand—mightn't we be sacrificing a certain something? Perhaps it might pay to wait. Let's call a conference Tuesday. Or would Thursday be better?

The Cheerleader . . . "You've got a great future with the company, my boy, so give it all you've got. We've got a great team. Great product, too. Expanding market. Brave new world. Pay raise later? Boy, don't pin me down."

Mr. Double-Dotted "i" . . . Hands you the same kind of job you've done all these years, then tells you in minute detail how to do it. Thirty minutes later you have full instructions for cleaning the last speck of dust off the assembly-room floor, but you've forgotten what you were going to assemble.

Old Man River . . . On and on, over a flood-tide of words. Will your tired raft ever reach a landing?

Space Ship to Mars . . . He's worked out the grand strategy. The details are up to you.

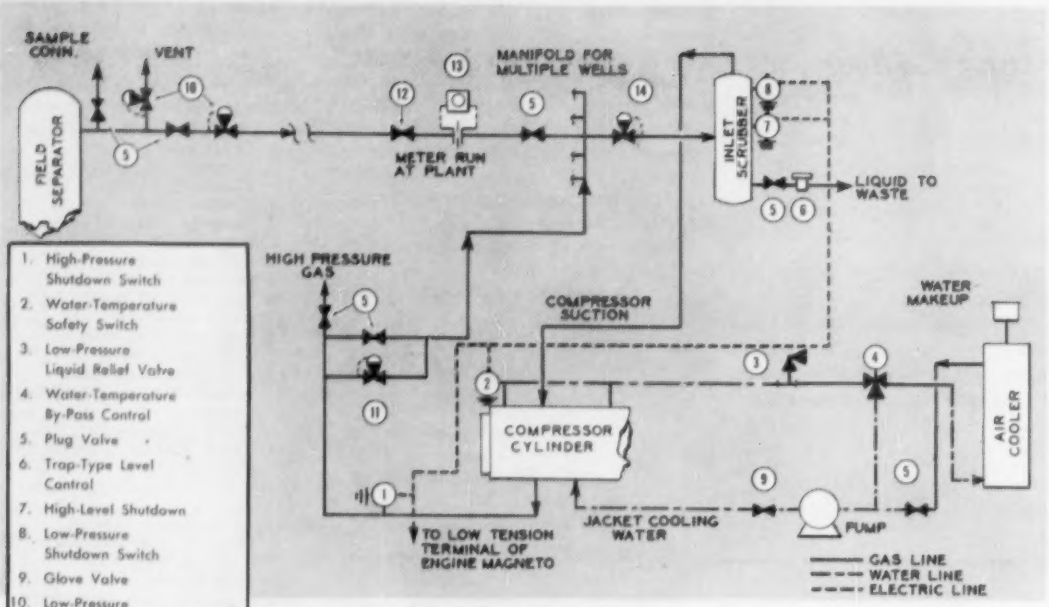
Three-Belled Grapple . . . His desk is so full of a number of things, how can he possibly concentrate on you? His phones ring constantly, and he takes every call himself. In between, he barks over the intercom and dictates in snatches to his secretary. But he hears every word you're saying. Huh? How was that?

The Fuzzy Concluder . . . Let's see now, what did we decide? I'm going to send you 10 men for the job. Oh, you said 30? But that was Plan A, wasn't it? Oh, Plan C? Sorry. Sorry. (You'll be sorry too if you don't get the agreement down in black and white, in triplicate.)

The Commandant . . . Communicate? Nonsense! Push the right button and they'll jump. That's what they're paid for, isn't it?

Material furnished by American Management Association.

For another presentation on the subject, "Better Management," turn to page 85, this issue.



LEASE GAS BOOSTER for small operations needs many controls to protect equipment and minimize attention. Fig. 1.

ELEMENTS OF FIELD PROCESSING—24

Control of Field Booster Compressors

by Dr. John M. Campbell
University of Oklahoma

MOST of the controls on a field booster compressor are designed to protect the equipment and facilitate operation, with minimum attention, for it is theoretically possible to operate the system with little more than manual control. The exact scheme used will of course vary with the application but that shown in Fig. 1 is typical of small lease operations where low-pressure gas is compressed in one stage.

No control and cooling system is shown for the engine, since this will depend on the engine manufacturer. On most small portable units the engine is self-contained with its own radiator and pump. If two-stage, or more, compression is used, the controls shown for the inlet scrubber would be duplicated for each interstage scrubber. A provision would also have to be made for interstage gas cooling.

The lease hookup shown is substantially that shown in Part 7 *(The Oil and Gas Journal, October 31, 1955)*. The back-pressure controller shown on the vent is to prevent overpressuring of the separator in case the compressor plant is down. The other back-pressure valve on the suction line is to prevent the plant from lowering the separator pressure by drawing off gas faster than it is produced. It should be set several psi. lower than the valve on the vent line.

The meter run is shown at the plant although it could be conveniently located at the separator. Check valve (12) is included to prevent the back flow which may result when multiple units feed the same compressor.

Butterfly valve (14) is an optional but desirable item to control the compressor suction pressure. All compressors are rated using a given suction and discharge pressure and this valve simply prevents the former from getting too low and overloading the unit. This valve is particularly desirable if the deliverability of gas to the plant is widely variant.

The inlet scrubber is primarily a protective device to keep liquid out of the cylinders and should not be used as a primary oil and gas separator. This vessel serves simply as a liquid sump and a convenient device on which to hang certain necessary controls. As a convenient rule-of-thumb, this vessel should have a cross-sectional area of at least 100 sq. ft. per M.M.c.f. per day of gas processed. The minimum size is normally 12 in. A float-operated trap (6) is very satisfactory for controlling the liquid level.

Switches (1), (2), (7), and (8) constitute the basic safety shutdown system. These switches are normally open but if the condition at any one goes beyond set limits it closes, grounding out the engine magneto, which in turn stops the engine. All are simple and inexpensive, and afford positive protection. A horn or remote indicator may be incorporated that is actuated any time the compressor stops.

Switches (1) and (8) are high and low-pressure shutdowns respectively. They serve to keep these pressures within the limits set up for the compressor. Switch (2) is a high-tempera-

ture shutdown that is actuated by the hot water leaving the cylinder jacket. It shuts down the unit when any failure occurs in the cooling system.

Switch (8) is a high-level shutdown that operates when the liquid level becomes too high in the scrubber due either to failure of valve (6) or to an excess quantity of liquid entering the plant.

Bypass valve (5) downstream from the compressor is desirable for it provides a means of taking the load off the compressor, particularly during startup. During normal startup this valve would be open and gradually closed once the compressor and engine reached running speed.

The bypass relief valve (11) is an optional and, to a certain extent, a luxury item for it duplicates the protection offered by switch (1). It provides relief in the event the outlet or bypass valves are inadvertently closed, without shutting down the compressor. If used it would normally be set to open 5 to 10 psig. before the high-pressure switch closes.

The water-temperature bypass control (4) serves to control the jacket-water temperature by governing the amount of water to the cooler. In its simplest and cheapest form it consists of an automobile-radiator type of thermostat in a three-way cast-iron valve body. It is substantially the same device used on most oil-field engines. A conventional temperature control would of course be satisfactory but its cost cannot be justified unless it is a large installation or where the complexity of the system does not lend itself to this type of control. In some cases where several services are handled by the same cooler it is often more satisfactory to control the temperature by varying the speed or pitch of the fan.

Although no scale trap is shown it is normally a good policy to have one to prevent accumulation and possible system damage. Some provision for water makeup is necessary so a small surge tank on top of the cooler should be provided for this purpose. Drains should be provided so that the system may be completely drained.

Popoff valve (3) is primarily to prevent overpressure of the system, particularly the radiator. A simple brass valve ½ to 1 in. in size is normally sufficient.

On large systems a standpipe may be used ahead of the pump suction to handle surges and serve as a water reservoir.

"It's a good policy to have a scale trap to prevent accumulation and possible system damage."

ON THE JOB . . . . . IN THE PLANTS

Esso employes declare . . .

WAR ON FIRES!

● Plantwide training, ● Modern equipment, and ● Timing make best ammunition

THE proverbial ounce of prevention is taken in king-sized doses at Esso Standard Oil Co.'s Baton Rouge refinery when it comes to fire prevention.

A combination of modern equipment, intensive training, and close coordination keynote the operations of the fire department there.

Fulltime shift personnel of the department have four modern fire engines at their command to respond to fire calls. They're backed up by a special fire-fighting group made up of tube cleaners, pipefitters, machinists, and other shift personnel also on call to report to fire calls when they occur.

Onsite equipment available to this group includes 1½-in. fire hose equipped with fog nozzles on reels located at all units, and monitor nozzles at the larger units. These latter are fixed nozzles for use in cooling the structures if necessary and are mounted and aimed like artillery pieces. Foam systems are installed on storage tanks which require them. The two foam trucks available can be used to service other tanks as needed. About 1,200 first-aid fire extinguishers also are scattered throughout the plant.

A new and interesting protection system has been installed at the loading docks along the river. A series of fog nozzles has been installed just below the dock level. When water is turned into the system, these nozzles release a fine spray which cools pipelines and other equipment located below the dock level. A remote-control panel outside the dockmaster's office is used to operate the system.

Unit control . . . The members of the fire-protection group receive special training in fire-fighting techniques at training grounds operated by the fire department. Actual fires are extinguished by participants in the training courses to give them an on-the-spot feel and experience. Refresher courses are given periodically in order to keep personnel familiar with equipment and techniques.

Esso's approach to fire prevention has not been to limit fire fighting to the fire-protection group. It has been extended to include about 1,500 people to date throughout the plant including laboratory employes and process men on the units. This training is continuing and will include more people. A class for about 400 process operators is planned. Thus, in event of a fire, operating personnel have a thorough knowledge of fire-extinguishing methods. After notifying the office of emergency coordination of the fire, they can proceed to combat a blaze intelligently on their own unit the instant it's discovered without waiting for the arrival of the fire-protection group.

Notification . . . With the widespread

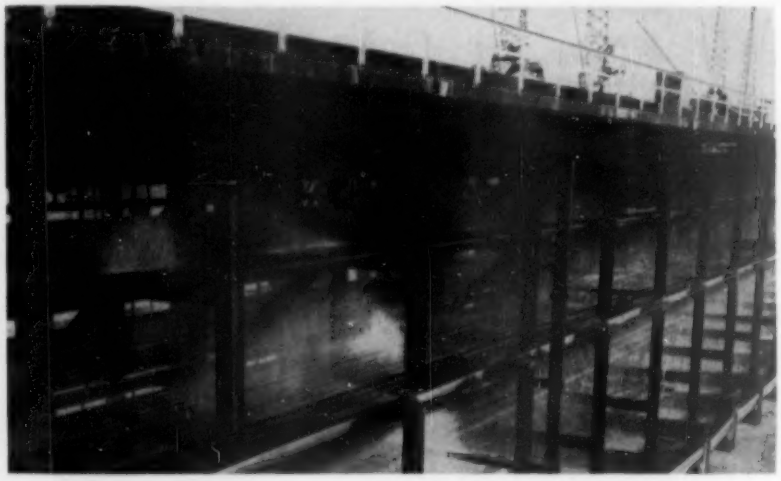
Plantwide training . . . TRAINING SESSIONS include handling various types of fires at Esso's training grounds. Plant employes watch a demonstration on the proper use of fire extinguishers at the Baton Rouge refinery.

plant installations at Baton Rouge, a notification procedure is necessary to insure smooth and rapid functioning of the fire-protection system. When an employe sees a fire, he dials 555. This connects him to the office of emergency coordination. This O.E.C. phone is located at guard-department headquarters at one of the main gates.

The guard on duty gets the pertinent information and then uses phone, and/or radio, to notify the fire department and night superintendent. The superintendent then coordinates all fire-extinguishing activities within the plant. The O.E.C. also notifies mechanical people, tube cleaners, supervisors, and management individuals as requested by the night superintendent.

The night superintendent sets up coordination headquarters in his car which is placed in a strategic location near the fire. All fire-protection personnel report to him and receive instructions through him. Management people who come to the fire act as advisors to the coordinator, but all orders must be issued through this one person. Communications at the scene of the fire are handled by two-way radio, a public-address system, and power megaphones. With this procedure, all information and dispatches channel through one central point to insure full coordination of fire-fighting activities.

Advance training . . . Esso doesn't stop with this set program, but has a continuing arrangement with outside schools. Fire-department representatives annually attend these schools to keep pace with the latest developments in equipment and techniques for better ways of combating fires.



Modern equipment . . . A spray system for cooling pipes in case of emergency has been installed on Esso's docks.

Close coordination . . . Pipefitters on their way as a fire-fighting group after receiving a call from the coordination office.

by W. L. Nelson
Technical Editor

COST-imating

23. Cost of Excavation, Foundations, and Concrete

COST INDEXES (1946 = 100) FOR CONSTRUCTION OPERATIONS

	Construction machinery*	Concrete ingredients	Steel rein.	Common labor	Skilled labor	Construction (ENR)
1946	100	100	100	100	100	100
1947	114	111	115	115	112	119
1948	128	119	136	131	125	134
1949	136	122	148	140	134	138
1950	140	125	154	148	140	147
1951	155	133	162	157	148	157
1952	158	133	170	168	158	164
1953	162	138	183	181	167	173
1954	160	142	187	192	175	182
1955	172	147	196	202	180	190
1956 est.				209	188	

*Bureau Labor Statistics. It is assumed that rental rates on construction equipment will change in somewhat the same ratios.

THE brake horsepower per cubic yard of foundation ranges from 8 to 12, and the minimum ratios of foundation to machine weight are about:

Vertical engines	2-4
Pumps and horizontal engines	2.5-3
Fast steam or poorly balanced crank and flywheel pumps and compressors	4-5

The weight of concrete is about 4,000 lb. per cu. yd.

TABLE 2—APPROXIMATE COST (1946) OF CLEARING, GRADING, EXCAVATION, ETC.*

Description—	Unit	Labor
Grubbing, thick brush	$/acre	250-350
Clearing land, thick pine growth	$/acre	180-240
Clearing land, thin stand, small trees	$/acre	40-45
Grassing	ct./sq. yd.	12-15
Shoveling:		
Sand and loam, regular	$/cu. yd.	0.90-1.00
Clay or heavy soil	$/cu. yd.	1.15-1.35
Hard pan	$/cu. yd.	1.35-1.60
Blasting, air drill (1-2 lb. dynamite)	$/cu. yd.	0.85
Grading:		
Gravel or loam	cts./cu. yd.	4.5-5.0
(tractor) fairly tight clay	cts./cu. yd.	6.0-7.0
Very hard soil	cts./cu. yd.	11.0-15.0
Grading, ripper plow and tractor:		
Gravel or loam	cts./cu. yd.	1.0-1.2
Fairly tight clay	cts./cu. yd.	1.5-1.7
Very hard soil	cts./cu. yd.	2.4-2.7
Scraping, tractor, 200 ft.:		
4-ft. scraper, 15 hp.	cts./cu. yd.	19-22
6-ft. scraper, 30 hp.	cts./cu. yd.	15-17
10-ft. scraper, 60 hp.	cts./cu. yd.	12-15
Excavation, large, road, common†	$/cu. yd.	35-40
Excavation, large, road, rock	$/cu. yd.	1.20-1.65
Excavation, large, dam, common†	$/cu. yd.	0.40-0.47
Excavation, large, dam, rock	$/cu. yd.	2.05-2.15
Excavation, large, dam, borrow†	$/cu. yd.	0.14-0.40
Excavation, small, common, 100 yd.	$/cu. yd.	0.90-2.00
Excavation, small, rock, 10 yd.	$/cu. yd.	4.00-6.00
Excavation, very small	$/cu. yd.	1.50-2.50

*Heinecke, G. W., Pet. Engineer, Dec. 1932, p. 21; Engineering News Record, March 1949; and author's files. †See also: Jacox, L. C., "Large Earthmoving Machinery and Costs," Eng. News Record, Oct. 7, 1954, pp. 172-183.

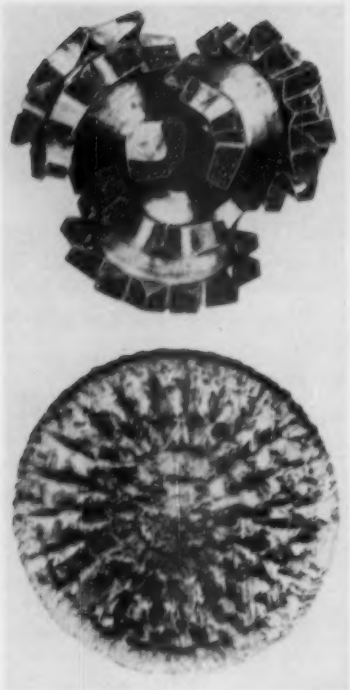
TABLE 1—APPROXIMATE COSTS (1946) OF FOUNDATION MATERIALS AND LABOR

	Unit	Material	Labor	M & L
Sand, truck lots or more	$/ton	*1.14-2.50	0.50	1.64-3.00
Rock, crushed stone or washed gravel	$/ton	2.00-3.00	0.85	2.25-3.85
Cement, carload lots	$/bbl.	1.90-2.70	0.12	2.02-2.82
Cement, small lots	$/sack	0.60-0.84	0.05	0.65-0.89
Reinforcing steel	ct./lb.	4-8	1.5-2.0	4.5-6.0
Trench and sump covers	ct./lb.	9-13		
Anchor bolts	ct./lb.	12-15		
Mix and place concrete	$/cu. yd.		3-4	3-4
Bases for roads or foundations	ct./sq. yd.			26-35
Motor finish	ct./sq. ft.	3	3.5	6.5
Piling, wood	$/ft.			0.26-0.36
Piling, concrete	$/ft.			1.85
Excavation, small or hand	$/cu. yd.		1.5-2.5	1.5-2.5
Forms, pump or foundation	ct./sq. ft.	9-10	24-28	34-37
Forms, roof slab or beams	ct./sq. ft.	21-24	11-13	33-36
Concrete, ready mix, 1:2:4, 50 yd. or more delivered	$/cu. yd.	5.60-9.50		5.60-9.50
Concrete foundations, rough small	$/cu. yd.	10-12	9-16	20-28
Flat—paving, floors, curbs, etc.	$/cu. yd.	12-16	15-24	29-36
Sidewalks	$/sq. ft.			4-5
Light—trenches, drains, firewalls, pipe supports, etc.	$/cu. yd.	14-24	44-48	50-67
Medium—pumps, compressors, buildings, tank rings, pipestills	$/cu. yd.	13-20	15-31	30-48
Heavy—stacks, towers, structures	$/cu. yd.	12-20	13-21	27-38
Concrete roof slabs, including beams	$/cu. yd.	16-18	20-25	37-42
Encasing columns with concrete, low	$/cu. yd.	16-18	22-28	39-44
Encasing columns with concrete, to 30-ft.	$/cu. yd.	16-20	100-110	116-130
Encasing crossbeams	$/cu. yd.	16-20	60-70	76-90
Concrete in dams	$/cu. yd.			8-14

*All major cities except Denver at $1.00 per ton.

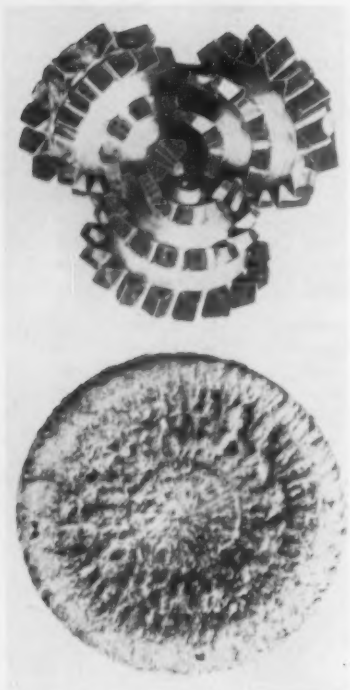
Rock-Bit Design
Part 11

MODERN DRILLING



TYPICAL TYPE A three-cone bit and bottom-hole pattern. Fig. 18.

TYPICAL TYPE B three-cone bit and bottom-hole pattern. Fig. 19.



TYPICAL TYPE C three-cone bit and bottom-hole pattern. Fig. 20.

Why Are Bit-Design Factors Important?

by H. G. Bentson
H. C. Smith Tool Co.

SINCE the drilling characteristics of each formation requires a type of bit which combines various factors of design, it is obvious that each type must be designed for a specific purpose.

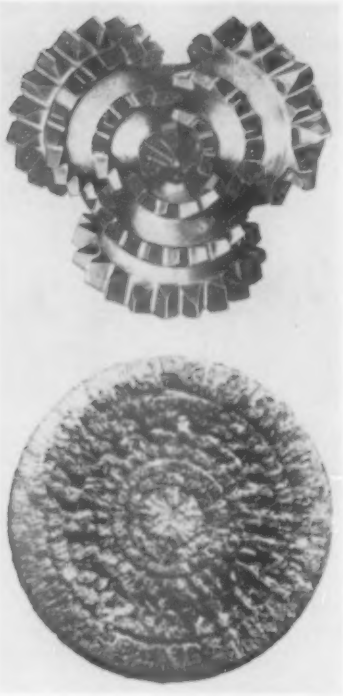
A knowledge of these design factors and their application to specific types of bits is important for better selection and evaluation of rock bits. Although considerable similarity must exist in the design factors and their application in all bits, this discussion is based primarily on data encompassing one size group and one manufacturer.

Soft formations . . . A typical A type of three-cone bit *(see Part 10 of this series, The Oil and Gas Journal, December 10, 1956, for classification)* designed for drilling the softest formations is illustrated by Fig. 18. Since softest formations are drilled best with maximum gouging-scraping action, the rolling characteristic of the cones must be that which varies the greatest.

Therefore the A type of bit incorporates the smallest journal angle, largest offset, and greatest variation in cone profile angles, as compared to other three-cone types of bits.

Inasmuch as penetration in this formation is a function of the tooth geometry, tooth depth is maximum and the included angle minimum. Widely spaced teeth and ample deletions are provided for optimum self-cleaning properties and for increased resistance to formation packing.

Although the amount of gage protection is less than that for any of the other types, due to the fewer number of gage teeth, this amount provides ample protection against excessive wear in most formations. Fig. 18 shows how tungsten carbide



TYPICAL TYPE D three-cone bit and bottom-hole pattern. Fig. 21.

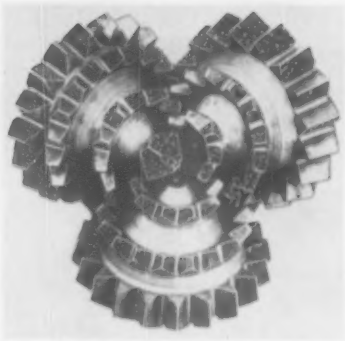
facing is applied to the outer end and one full face, and to the tip of the opposing face of each tooth for increased wear resistance.

Full facing . . . In some instances, however, full facing has been applied to both sides of the teeth for maximum wear resistance in abrasive formations. Since tooth depth is maximum in comparison to other three-cone types, the bearing structure size must of necessity be as small or smaller.

Fig. 18 also shows the bottom-hole pattern developed by this bit type. The scraping action effect is represented by the smoother surface toward the center; whereas the gouging effect is represented by the rougher portion toward the outside.

Soft to medium bits . . . Fig. 19 illustrates a typical B type of three-cone bit designed for use in soft to medium formations or soft formations interspersed with harder streaks, which also are drilled best with a maximum gouging-scraping action. This bit usually incorporates the same journal angle and offset as that of the A type.

Since the cone profile angles also approximate those of the A type, a maximum gouging-scraping action is still maintained for drilling the softer formations. In order to drill the harder streaks, however, teeth more closely spaced and slightly shallower than those of type A, but with the same included angle, are used. Sufficient deletions are again provided for proper self-cleaning in the soft formations, and increased gage protection over that on the A type provides greater resistance to gage wear in the harder streaks.



TYPICAL TYPE E three-cone bit. Fig. 22.

As illustrated, tooth hardsurfacing is generally restricted to the outer end and one full face. To obtain a maximum self-sharpening effect required for the harder streaks, tungsten carbide is not applied to the opposing face. Bearing capacity may or may not be greater than that of the A type. Since the teeth are more closely spaced, the bottom-hole pattern presents a cleaner appearance but retains the gouging-scraping effect.

More teeth . . . For soft to medium formations interspersed with hard streaks, a C type of bit such as shown by Fig. 20 is generally used. The gouging-scraping action required also for this formation is again maintained by using the same journal angle and offset as that used for A and B types. However, since the drillability of this formation type of bit is somewhat less than that for the B type, a greater number of teeth having larger included angles are used.

Inasmuch as the harder formation restricts tooth penetration, tooth depth is decreased to provide for an increase in bearing capacity. Gage tooth deletions are maintained to prevent packing in the softer formations that may be encountered.

Increased gage protection over that on the B type of bit is accomplished by the use of a larger number of gage teeth. As shown in Fig. 20, tooth facing consists of one side fully faced, the opposing side tipped, and the outer end faced. The bottom-hole pattern for this type indicates the combined effect of a maximum gouging-scraping action and more closely spaced teeth.

Fig. 21 illustrates a typical D type of three-cone bit designed for drilling medium to medium-hard formations.

Since this type of formation is best drilled with a combined gouging-scraping and chipping-crushing action, a maximum journal angle and a medium offset value are used. In comparison with the A, B, and C types of bits, variations in cone profile angles are also less severe.

More closely spaced, heavier, and shallower teeth are provided to withstand the heavier impact loads to which they are subjected in these formations. For this particular medium formation type of bit, deletions are incorporated to reduce the tendency of the teeth to pack and to permit increased penetration rates where undergage problems do not exist.

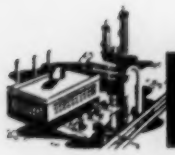
However, gage protection is increased over that on the softer bit types, due to the increase in the number of teeth. Facing is applied to one full face and to the outer end of each tooth only in order to promote a greater self-sharpening effect.

Although the teeth are slightly shallower than those of the C type of bit, bearing capacity generally remains the same with the added space utilized for greater cone-shell thickness. The effect of the combined gouging-scraping and chipping-crushing action is shown by the bottom-hole pattern.

Medium-hard formations . . . The typical E type of three-cone bit illustrated by Fig. 22 is designed for use in medium-hard formations. Except for the omission of deletions and the increased gage protection obtained thereby, this design is identical to that of the D type of bit. The increase in gage protection is required to offset the greater quantities of abrasive material generally encountered in this class of formation.

Due to its similarity to that for the D type of bit, no bottom-hole pattern is shown for the E type of bit shown in Fig. 22.

Editor's Note—This is Part II in a series on rock-bit design, selection, and evaluation.



THE FOREMAN'S PAGE

Refining • Petrochem • Natural Gasoline

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—74

How to Correct Improper Tower Operation

FOULING of the water side of heat exchangers proceeds rapidly when the outlet water temperature rises above 125° F. It is, therefore, imperative that these temperatures be checked from time to time in order to minimize fouling.

Fluctuations in feed rate . . . Rapid fluctuations in the feed rate to a lower cause successive reductions and increases in operating pressures and temperatures. This slugging will cause contamination of the products and should be minimized by more gradual changes in operation if possible.

It is particularly important that operating changes be gradual in a case where one unit depends on another for its feed stock. For example, polyform unit propane feed originates at TCC No. 1 and gas plant No. 3. Fluctuations in this feed rate cause severe upsets in Polyform Unit operations.

Correcting processing difficulties . . . Shown here is a general guide for correcting some of the improper tower operating conditions which are often encountered in the refinery. Several corrective measures are shown for each condition.

CORRECTION DATA

Process difficulty	Direction	Remedy
Improper temperature	High	Increase reflux rate. Lower reboiler temperature. Reduce feed and/or reflux temperature. Increase tower pressure.
	Low	Increase reboiler temperature. Lower tower pressure. Reduce reflux rate as a last resort.

This material is taken from "Fundamentals of Refining," operating manual of Magnolia Petroleum Co., refining division, Beaumont, Tex.

The capacity of a distillation tower is often limited by the performance of auxiliary equipment.

Cooling water limitation . . . The effects of inadequate cooling on tower temperature gradient and product purity have been discussed before. These effects emphasize the importance of reducing fouling of condensers and coolers by such means as maintaining low outlet water temperatures (i.e., below 125° F.)

Once fouling has started, the least costly way of overcoming the limitation must be settled. If backwashing connections are available, fouling can often be reduced by frequently reversing the flow of water through the bundle. If backwashing is not successful, a cooling limitation can sometimes be overcome by increasing the tower pressure.

At a higher tower pressure, the top temperature is higher for a given overhead product composition, and therefore, the temperature difference between the overhead and the cooling water is increased.

Since the cooling rate is proportional to the temperature difference between the shell side and tube side, cooling water limitations can often be eliminated by increasing tower pressure.

In some cases, however, this is not practicable. Under these circumstances, equipment changes would have to be made. These might include:

1. Installation of additional condensers and coolers.

2. Installation of additional cooling tower.

3. Increased water circulation by installation of larger water pumps.

4. Installation of a sponge stream system, i.e., the pumping of a relatively heavy liquid into the overhead line to promote condensation.

Reboiler size limitation . . . When the reboiler is too small, the effect is similar to the cooling water limitation already discussed in the effect on tower temperature gradient. Fortunately, more techniques are available for overcoming reboiler limitations. Some of these are:

1. Increased feed preheat.

2. Lower reflux when this is possible without seriously affecting product purity.

3. Lower tower operating pressure. This increases the temperature difference between the shell and tube side and, consequently, increases heat supply.

4. Increased steam pressure or increased hot-oil circulation. This also increases the temperature difference between the shell and tube side.

Pump limitations . . . When a pumping limitation causes a reduction in tower capacity, tower operation is often altered and results in loss of product yield and quality.

Summary

Satisfactory operation of reboiler type of towers is dependent on realization of proper operating conditions. If correct conditions are not selected, product purity is degraded and yields are low. The effectiveness of unit control is increased by:

1. Continuous use of laboratory test.

2. Maintenance of tower operating conditions by frequent inspection of instruments by operating personnel.

3. Studying and passing on any suggestions or ideas to your supervisor for better unit control.

A 10-MINUTE JOURNAL FEATURE

Better Management

Understand completely job to be done

Select ability to carry out orders

Achieve willingness to carry out orders

THE most important single thing to bear in mind about giving orders is that an order is a means to an end. An order is given because it is necessary or desirable to bring about certain results. When we look at order-giving in the light of this "results" approach, several points become clear. *Check these through, one by one:*

☐ The employe concerned must have the training, skill, and physical ability to carry out the order satisfactorily.

☐ Best results will be obtained if the man carries out the order willingly. Every manager should recognize that the way in which an order is given—the words, tone of voice, and apparent attitude that accompany the order—affect the relationship between giver and receiver.

☐ The order should be made important in the mind of the man to whom it is given. Since the purpose of an order is to bring about a given result, the subordinate involved must be induced to take the order seriously. Depending on authority alone to make an order important usually produces less than satisfactory results. The really essential point to recognize is that an order will be no more important to the man who receives it than it is apparently regarded by the man who gives it. *(Orders issued "on the run" are often executed in the same fashion.)*

☐ Make orders perfectly clear, so that there can be no doubt about (1) what a man is to do, and (2) when he is to do it. Accordingly, *it is necessary to "speak the same language" as the man who receives the order,* using words that can mean to him only what the order is intended to convey. It is by no means uncommon, as most supervisors know, to see a man nod his head in apparent understanding and then proceed quite dutifully to do the wrong thing. Crossed wires or mixed signals are the products of unclear orders.

State the Results Expected

Since an order is a means to an end, whenever practical an order should state the results expected. For every man, whatever his job, is entitled to know by what standard, what yardstick, his performance will be judged. In addition, spelling out the results expected helps to fix responsibility for them.

Follow up . . . If it is accepted that an order is simply a means to an end, it follows that the mere act of "giving orders" is only half the story. The other, equally impor-

TIPS ON HOW TO

Impress importance of orders

Make orders understandable

Demonstrate when necessary

tant, half of this function can be described in two short words—FOLLOW UP.

After giving an order, a manager can do one of two things. He can assume that the work called for by the order will be done, that it will be done right, and that the results will be satisfactory. Or he can check and follow through on the progress of the work, to make certain that it is, in fact, being done, that it is being done right, and that the results will be satisfactory. The choice—or compromise—he makes between these two alternatives will have a far-reaching effect upon the kind of results obtained.

Suggestions on Order-Giving

It is of the utmost importance that a manager give sufficient thought and attention to the subject of giving orders. Then the members of his group will understand thoroughly what is expected of them, and how it should be done.

Supervisors and executives must follow these guides. Else they will fail to get their directions across:

1. Instructions should be organized in logical order. Don't give orders in a disorderly or haphazard way.

2. Be sure that the worker understands exactly what is expected of him. Don't assume that he already knows.

3. Speak distinctly, and select words that fully convey your true meaning.

Some pointers . . . Remember these suggestions when giving orders. Their application will make the job more pleasant and more nearly complete as prescribed, on schedule, and without mishap:

Know and understand thoroughly the job to be done.

Assign work to the proper employe. Some workers are more skilled or adept at certain jobs than others. It is particularly important to assign hazardous work to a thoroughly trained and capable man. Be impartial, however, in the distribution of work. Don't overload the willing worker.

Give orders clearly, concisely, distinctly.

Don't assume orders are understood. Be sure they are understood. Repeat them if necessary. It is usually good practice to ask if the orders are understood.

Keep orders on a high level; avoid sarcasm or other forms of antagonism.

If necessary, demonstrate. This is an excellent aid to clear appreciation of the problem.

Do not give too many orders at one time. This can

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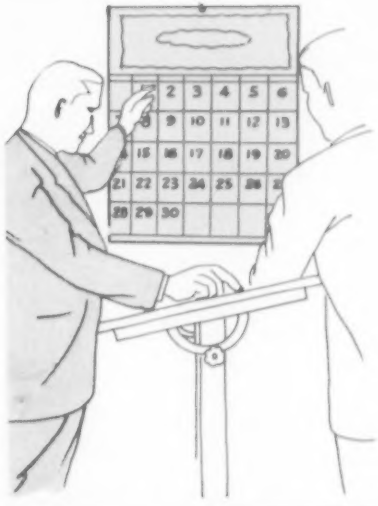
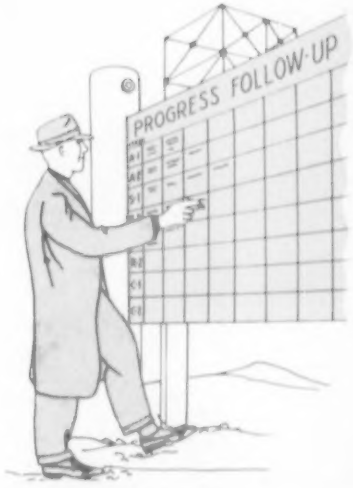
O GIVE ORDERS

Keep proper attitude



Outline results expected



Follow progress of work

be very confusing. Confusion leads to accident and waste.

Allow a reasonable time for work to be done.

If a worker is capable, do not nag or stand over him.

Give orders through proper channels. Intermediate supervisors should never be bypassed or ignored in getting word to a worker to perform a task. The worker should be made to realize that his immediate supervisor is the one to whom he should look for direction and instruction. He should realize that his immediate supervisor not only has the responsibility of getting the job done, but has authority to a comparable degree.

Give adequate details, but do not confuse. Detailed orders are desirable when hazards exist, or where the work is of a special or infrequent nature, or with men of limited experience, or where a standard procedure is desired, or in teaching.

Follow through. It may be desirable after a reasonable time to check back and be sure that the worker has understood and that he is performing his job satisfactorily.

Some Orders Should Be Written

Another phase that will do a lot toward preventing misunderstandings is the use of written orders. "Put it in writing" is frequently a wise admonition to follow. It is desirable that those responsible for developing or passing on to other groups company policies, or interpretations of company policies put them in writing, in clear, simple words. In that way there will always be a record of the order having been issued, and the chances of its being understood and retained are greatly improved.

Convey Enthusiasm for Job to Be Done

It is surprising how much effect the tone of the supervisor's voice has on the person to whom he is giving the order. If the supervisor is impatient, abrupt, and unreasonable, and lets such feeling creep into his voice at the time he is giving the instructions, that same feeling will be conveyed to the worker. Sometimes a person may be quite preoccupied with something of a serious and urgent nature, and as a result may be short in instructing his workers. Almost invariably workers will reflect in their attitude the approach of the supervisor.

It is very important to take time to instruct the worker in an enthusiastic and encouraging manner. The worker will do much better work.

This material was prepared from American Management Association's book, "Effective Communication on the Job."

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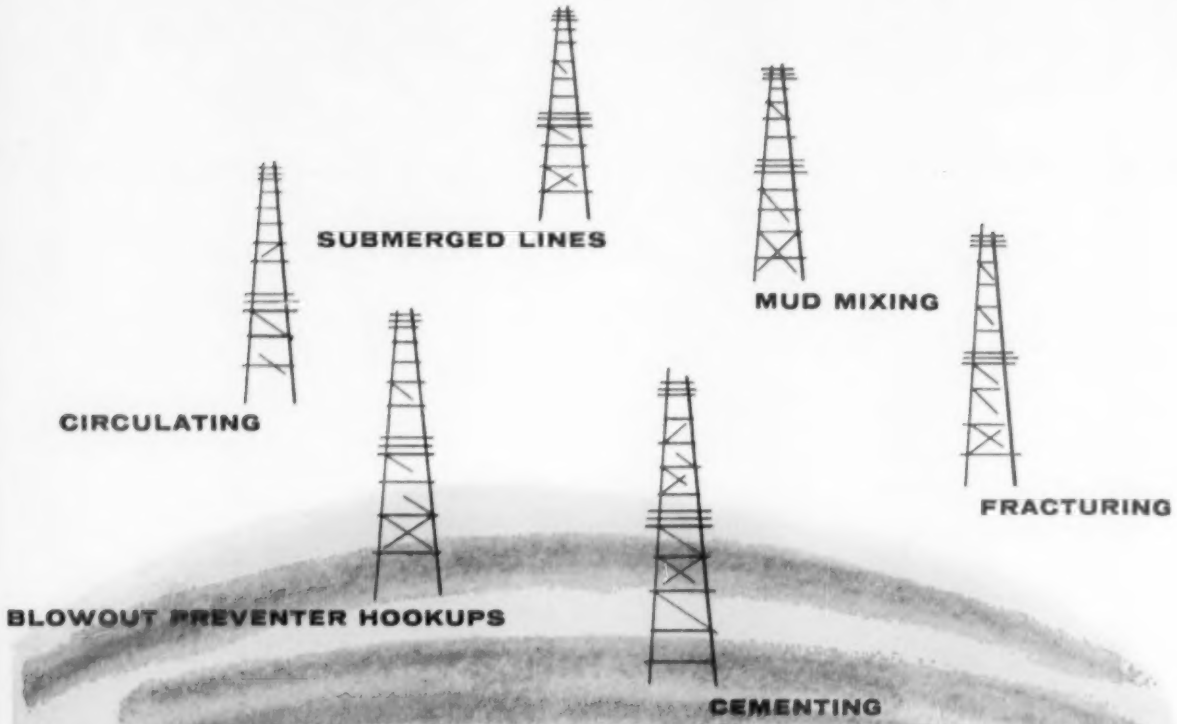

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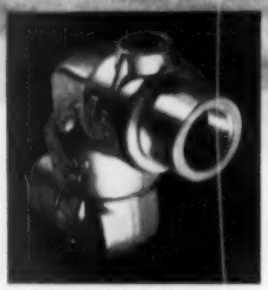

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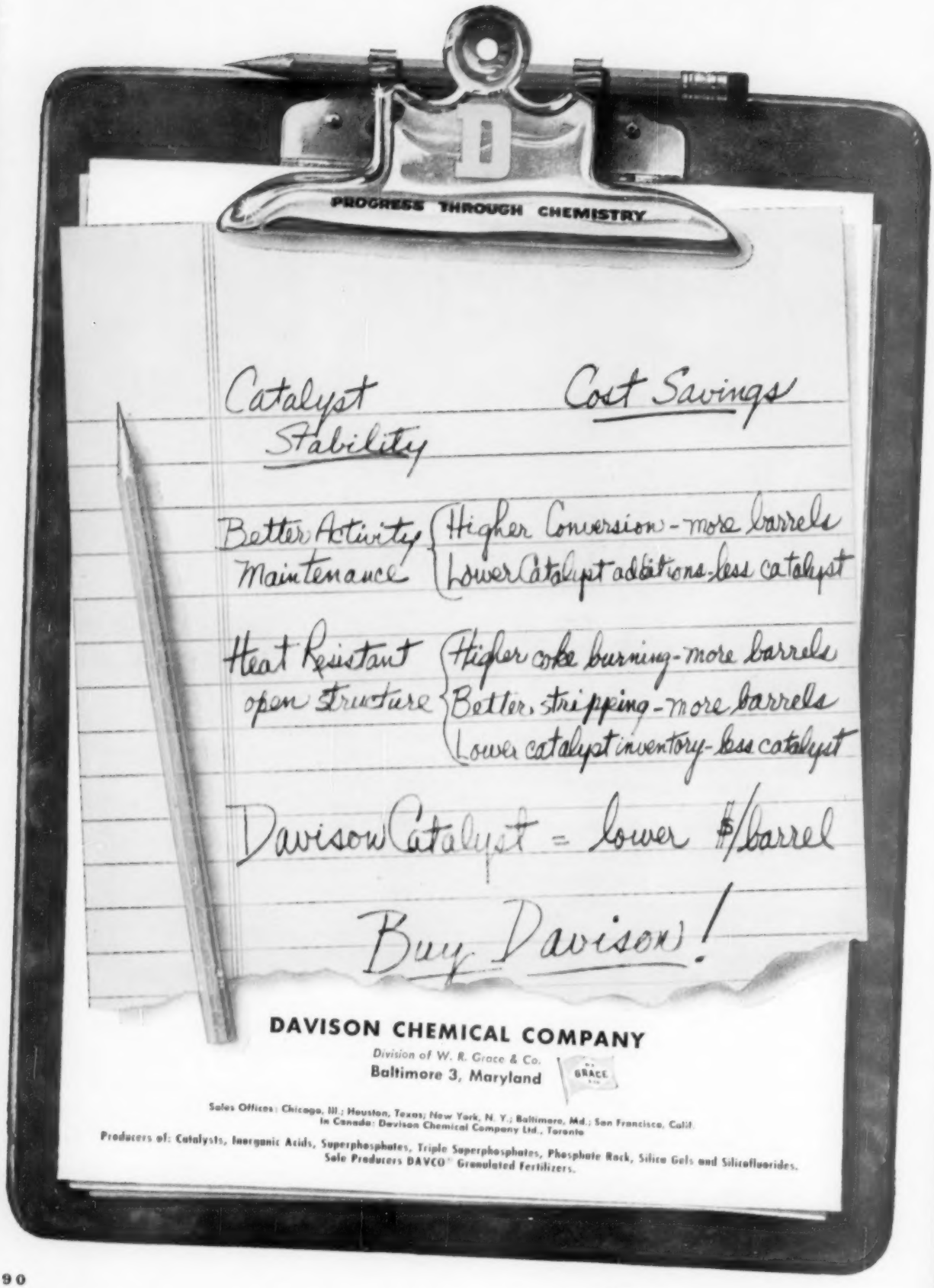
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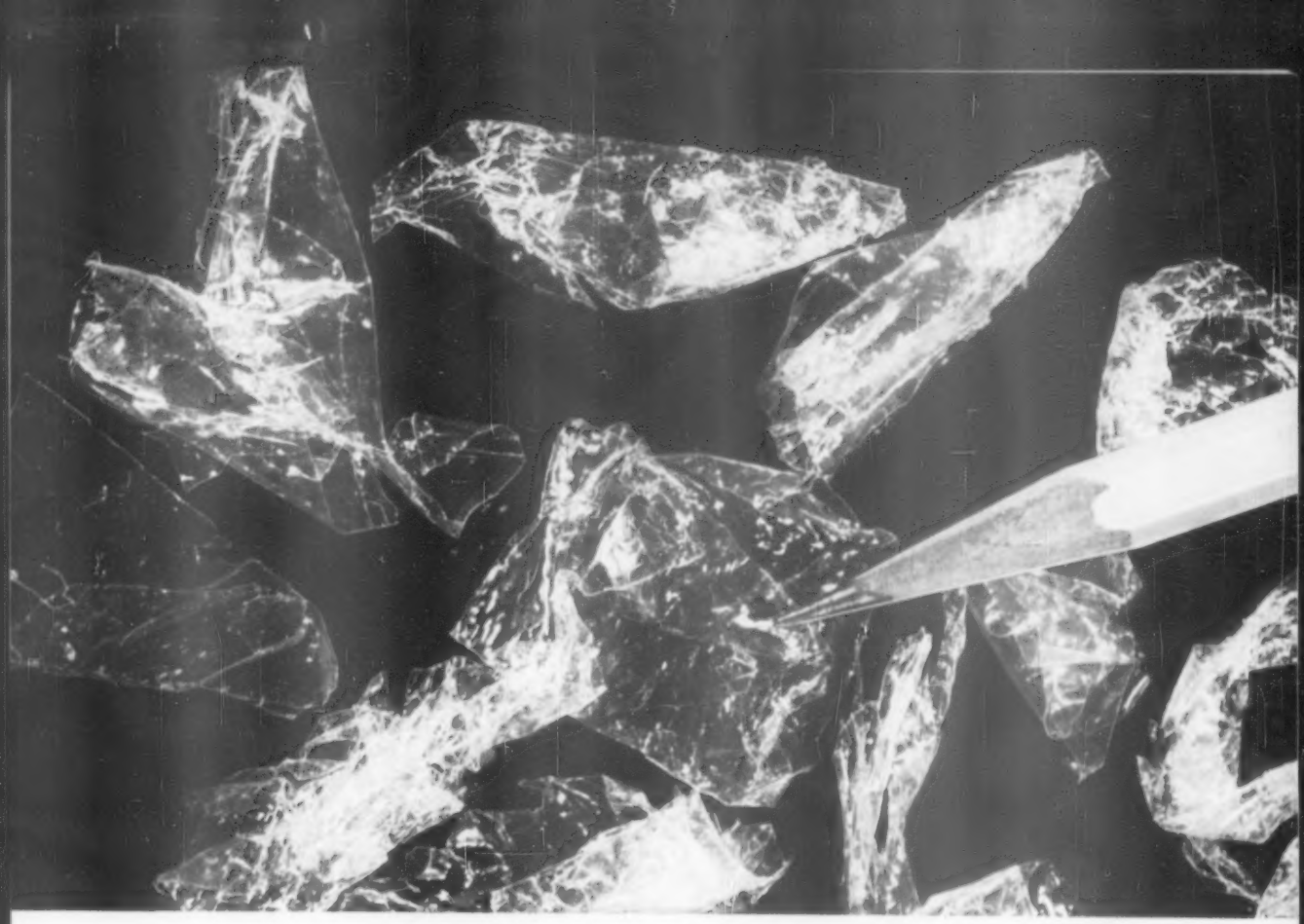

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Among the

Drilling Contractors

Eilers Drilling Co. is contractor on a new 8,500-ft. test off the southeast flank of the old Anse La Butte dome, in St. Martin Parish, South Louisiana. Operator is listed as Munoco, with headquarters at El Dorado, Ark. Location is for 1 Anasta, in 63-9s-5w.

Hayden Farmer & Drilling Co. has a new contract operation for Delphi Oil Co., of Tulsa, in Kaufman County, East Texas. It is a 5,500-ft. Paluxy test at a wildcat location, 1 Miller High, in the T. E. Sherwood Survey, 2 miles northwest of Cedarville.

Vick Drilling Co. is contractor on a 6,200-ft. Rodessa test in the J. J. Potter Survey, 7 miles northeast of Kildare, in Cass County, northeastern Texas. F. R. Jackson is operator. Location is at 1-A White.

Shaffer Drilling Co. is contractor on Davis Oil Co.'s new wildcat operation 4 miles south of Stegall, in southwestern Scotts Bluff County, western Nebraska. The test is on Davis Williams lease, in 9-21n-57w.

Mountain States Drilling Co., Denver, is getting under way on a remote wildcat test it has contracted to drill for John O. Mayberry in southern Franklin County, southeastern Idaho. Location is near the Utah line, and about 85 miles north of Salt Lake City. It will be drilled as 1 Utah-Idaho Exploration Co. Spot is in 15-16s-38e.

New Drilling Co., Denver, has a rig working for Stanolind Oil & Gas Co. at a wildcat location, 1-F State, in 16-17n-56w, about 2½ miles south of Vedene, in Banner County, Nebraska.

Big X Drilling Co., Oklahoma City, is drilling on a contract it has with Fain-Porter Drilling Co., Petroleum, Inc., and Decem Drilling Co. for an Oil Creek or 8,500-ft. test southeast of Norman, in Cleveland County, Oklahoma. Location is at 1 Harper, in 2-8n-2w.

W. C. Fatjo Drilling Co., Lafayette, La., has a contract with Tidewater Oil Co. for a 9,000-ft. test in the Savoy area, in southwestern St. Landry Parish, southern Louisiana. Location is on Tidewater's Abel Smith lease, in 16-6s-2e.

John W. Mecom, Houston, has a contract operation scheduled for St. John the Baptist Parish, southeastern Louisiana. It will be an 11,000-ft. wildcat test for Dietrich Oil & Gas Co. on Lutcher-Moore land in 19-10n-7e.

SPEAKING PANEL at December meeting in Oklahoma City of Central Oklahoma Chapter of the American Association of Oilwell Drilling Contractors. Front row, left to right: Gerald N. Eason, Fain-Porter Drilling Co., chapter chairman; Jack H. Abernathy, Big Chief Drilling Co., A.A.O.D.C. president; and W. R. Ewert, Kerr-McGee Oil Industries, Inc., program chairman. Back row, same order: Joseph M. Shelton, A.A.O.D.C. insurance consultant; Brad Mills, executive vice president; and Paul Cain, Cain Organization, Inc., public relations counselors of Dallas.

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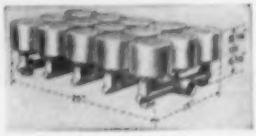

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Location is just south of Lake Maurepas, west of Lake Pontchartrain, and about 25 miles northwest of New Orleans.

Owen Drilling Co. is under contract for a 12,000-ft. test Petroleum, Inc., of Lafayette, La., is undertaking at a wildcat location a mile southeast of production in the Pine Bluff area, Acadia Parish, southern Louisiana. Location is for 1 D'Avy, in 19-9s-1w.

Ace Drilling Co., Dallas, is keeping a rig running for Thomas D. Humphrey & Sons in the David Gail area, south of Slocum, in Anderson County, East Texas. Latest operation is at 6 Bishop, in the W. R. Wilson Survey. It is a 6,200-ft. Woodbine test.

Makin Drilling Co., Hobbs, N. M., has contracted for a 4,900-ft. test Shell Oil Co. is starting at a wildcat location west of the Eunice-Monument area, in Lea County, New Mexico. Location is at 1 Allen Estate, in 27-19-35.

South States Drilling Co. has a new wildcat operation 5½ miles west of Tatum, in Rusk County, East Texas. It is a contract job for F. R. Jackson and John C. Robbins at 1 Sheffield, in the W. B. Hicks Survey. Contract is for 7,500 ft.

Fitzpatrick Drilling Co., Corpus Christi, is drilling for Pure Oil Co. at a wildcat location 8½ miles north of Mission, in southern Hidalgo County, South Texas. It is a 9,000-ft. test at 1 Felix Mottini, in the Jose Francisco de la Garza Survey, Block 4, Porcion 52.

Casey & Montgomery, Bakersfield, Calif., have a rig on a wildcat location 6 miles northwest of Poso Creek field, 20 miles north of Bakersfield, in north central Kern County, southern California, where they are drilling for Steele Petroleum Co. Drilling is set up for 7,500 ft. for a look at the Olcese, Vedder, and Famosa sands. Location is 2 miles east of Famoso in 4-27-26.

M & M Drilling Co., Houston, has taken on a deep-drilling contract in Evangeline Parish, southern Louisiana. It is with P. H. Welder, of Victoria, Tex., at 1 Deshotels, in 46-3s-1e, about 1½ miles northeast of Reddell field. Planned depth objective is 11,000 ft.

Calvert Drilling, Inc., Oklahoma City, is drilling a 5,600-ft. test for Midwest Oil Corp., at a wildcat location south of East Hobbs field, in eastern Lea County, New Mexico. Location is near the Texas line, in 7-19-39. It is listed as 1 Carter.

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Pipeline Patrol

. . . Report on Construction

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way. Uncontracted projects are indicated by • preceding the project.

Crude-Oil Pipelines

Fulton, R. H. & Co., Lubbock, Tex.
Project: 39 miles of 6-in. from Donkey Creek field in northeastern Wyoming, southeast to the Osage pump station in Weston County.
Status: Fulton, a contractor has applied to Wyoming Public Service Commission.

Humble Pipe Line Co.
Project: 94 miles of 18-in. from its Ector Station near Odessa to its Kemper Station near Big Lake, Tex.
Status: Under way.
Contractor: **Lone Star Constructors,** H. A. (Red) Wylie, superintendent, office at Big Lake.
Completion: Mid-February 1957.

• **Interstate Oil Pipe Line Co.**
Project: 5 miles of 4-in. from South Bosco field, Louisiana, to present main line, and 5 miles of various size from Church Point field, Louisiana, to present main line.
Status: Proposed.

Magnolia Pipe Line Co.
Project: 8 miles of 20-in. in Pulaski County, Arkansas.
Status: Under way.
Contractor: **O. R. Burden Construction Corp.,** C. M. Hoffman, spread superintendent, office at Roland, Ark.
Completion: January 10, 1957.

• **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest)
Project 80 miles of 8-in. and 300 miles of 10-in. crude and products line from Four Corners area to Salt Lake City.
Status: To start May 1957.
Completion: August 1957.

• **Offshore Gathering Corp.,** Houston.
Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana. (Dual line.)
Status: Proposed.

• **Pasotex Pipe Line Co.**
Project: 127 miles of 20-in. along its route from Wink to El Paso, retiring another dual 8-in. section.
Status: Planned.
Completion: July 31, 1957.

Service Pipe Line Co.
Project: 9 miles of 10-in. and 1 mile of 6-in. to connect Lake Washington field in Plaquemines Parish, Louisiana, with a tank terminal at Port Sulphur on the Mississippi River.
Status: Under way.
Contractor: **Sam Carline, Inc.,** Berwick, La.
Completion: February 1, 1957.

• **Sinclair Pipeline Co.**
Project: 150 miles of 20-in. from Teague, Tex., to Houston.
Status: Planned for 1958.
Completion: 1958.

• **Tecumseh Pipe Line System** (Joint venture of Sinclair Pipe Line, Ashland Oil & Refining, and Pure Oil Co.)
Project: 190 miles of 20-in. between Griffith, Ind., and Cygnet, Ohio.
Status: Under way.
Completion: September 1957.

Union Oil Co. of California.
Project: 45 miles of 12-in. and 180 miles of 16-in. crude and products line from San Joaquin Valley to its Oleum refinery at Rodeo, Calif.
Status: Under way.
Contractor: Being handled in six sections by various contractors.
Completion: April 1, 1957.

Products Pipelines

• **American Pipe Line Co.**
Project: Line from Gulf Coast to New York City area. Received ODM approval to amortize 40 per cent of $175,000,000 cost with a rapid writeoff.
Status: Planned.

• **El Paso Natural Gas Co.**
Project: 11 miles of 4-in. L.P.G. products from Snyder Line to South Andrews Plant, Texas.
Status: Planned.
Project: 80 miles of 8-in. and 300 miles of 10-in. products and crude line from Four Corners area to Salt Lake City.
Status: Planned.
Completion: August 1957.

• **Gulf Refining Co.**
Project: 530 miles of 10-in. L.P.G. and natural gasoline line from Waddell Plant in Crane County, Texas, to Mont Belview near Houston (368 miles is conversion from crude service).
Status: Under way.
Contractor: **Panama-Williams Corp.** has 46 miles from Waddell Plant to Midland. Remainder not let.

Magnolia Pipe Line Co.
Project: 18 miles of 6-in. L.P.G. line between Beaumont and Orange, Tex.
Status: Under way.
Contractor: **L. E. Farley, Inc.**
Completion: January 1, 1957.
Project: 15 miles of 4-in. L.P.G. line in Winkler County, Texas.
Status: Under way.
Contractor: **O. W. Mayfield,**
Completoin: January 1, 1957.
Project: 22 miles of 4-in. L.P.G. line in Lea County, New Mexico.
Status: Under way.
Contractor: **Cole and Fontaine.**
Completion: January 1, 1957.

• **Northwest Pipeline Corp.** (an affiliate of Pacific Northwest)
Project: 80 miles of 8-in. and 300 miles of 10-in. products and crude line from Four Corners area to Salt Lake City.
Status: To start May 1957.
Completion: August 1957.

• **Ohio Oil Co.**
Project: 350-miles of 12-in. from Wood Rivier, Ill. to Chicato.
Status: Planned. Starting date depends on pipe delivery, which may not be completed until 1958.

Plantation Pipe Line Co.
Project: 327 miles of 18-in. from Baton Rouge, La., to Helena, Ala.
Status: Under way.
Contractor: **Oklahoma Pipe Line Constructors;** N. L. **Arie,** spread man, office at Baton Rouge.
Completion: December 31, 1956.

Shell Oil Co., Pipe Line Dept.
Project: 16 miles of 4-in. gasoline line from

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ENGINEERS & SURVEYORS
HENINGER BLDG.
MONROE, LA.

SURVEYING & MAPPING

PIPE LINE SURVEYS

Pipeline Patrol

Wilmington, Calif., refinery to Los Angeles marketing depot.
Status: Under way.
Contractor: **Ledford Brothers.**
Completion: January 1, 1957.

• **Southern Pacific Pipe Lines, Inc.**
Project: 100 miles of 10-in., 80 miles of 8-in., and 125 miles of 6-in. between Richmond, Calif., and Fallon, Nev.
Status: Preliminary work under way.
Completion: August 1, 1957.

• **Union Oil Co. of California**
Project: 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its proposed Rifle shale-oil plant.
Status: Proposed.
Project: 45 miles of 12-in. and 180 miles of 16-in. crude and products line from San Joaquin Valley to its Oleum refinery at Rodeo, Calif.
Status: Under way.
Contractor: Being handled in six sections by various contractors.
Completion: April 1, 1957.
Project: 14 miles of 8-in. between Rodeo and Richmond, Calif.
Status: Planned.
Completion: February 1957.

• **Yellowstone Pipe Line Co.**
Project: 22 miles of 8-in. near Spokane, Wash.
Status: Planned.
Completion: March 1, 1957.

Non-Petroleum Pipelines

American Gilsonite Co.
Project: 70 miles of 6-in. from Bonanza, Utah, to Grand Junction, Colo., to carry slurry of gilsonite from mines to refinery now being built.
Status: Under way.
Contractor: **Engineers Limited Pipe Line Co.**
Completion: Early 1957.

Natural-Gas Pipelines

• **Arkansas Louisiana Gas Co.**
Project: Line from Texas-Louisiana coastal region to northern Louisiana, to connect with their present system.
Status: Long-range plans.

• **Carolina Pipeline Co.**
Project: Distribution lines to serve 14 cities in Central South Carolina. Will buy gas from Transcontinental Gas Pipeline Co. or Southern Natural Gas Co.
Status: Has received South Carolina Public Service Commission permit.

Cities Service Gas Co.
Project: 9 miles of 16-in. and 4 miles of 8-in. between Springfield and Galloway, Mo.
Status: Under way.
Contractor: **Prairie Construction Co.**
Completion: December 31, 1956.
Project: 3 miles of 12-in., 8 miles of 10-in., 5 miles of 8-in., 7 miles of 6-in., and 8 miles of 4-in. in Eureka fields, Grant and Alfalfa counties, Oklahoma.
Status: Under way.
Contractor: **Vaughn & Taylor.**
Completion: January 15, 1957.

• **Cities Service Pipe Line Co.**
Project: 27 miles of 6-in. from Lake Charles, La., to Orange, Tex.
Status: Planned.
Completion: April 30, 1957.

• **Coastal Transmission Corp.**
Project: 575 miles of 12, 20, 22, 24-in. main line and 368 miles of 2 to 14-in. gathering lines between McAllen, Tex., and Baton Rouge, La.
Status: Awaiting FPC approval.
Completion: January 1, 1958.

• **Colonial Natural Gas Corp.**
Project: Two systems; one between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.
Status: Proposed.

• **Colorado Interstate Gas Co.**
Project: 1957 program . . . 66 miles of 30-in., 40 miles of 34-in., 109 miles of 26-in., and 100 miles of 24-in. from Springfield, Colo., to Pueblo, Colo; 345 miles of 30-in. from Kit Carson, Colo., to Beatrice, Neb.; 50 miles of 22-in. from Laverne to Hooker, Okla.; 24 miles of 22-in. Panhandle field looping.
Status: Pending FPC approval.

Commonwealth Natural Gas Corp.
Project: 40 miles of 18-in. looping from Gum Springs to Chester, Va.
Status: Under way.
Contractor: **Pipeline Maintenance & Construction Co.**
Completion: January 15, 1957.

• **El Paso Natural Gas Co.**
Project: 193 miles of 34-in. between San Juan basin and Topock, Ariz., and 38 miles of 20-in. between San Juan mainline and Phoenix.
Status: Under way.
Contractor: Doing own construction.
Completion: February 1, 1957.
Project: 146 miles of 34-in. between San Juan basin and Topock.
Contractor: **Western Pipeline, Inc.**
Completion: February 1, 1957.
Project: 29 miles of 30-in. from Lindrith Station to Chaco Plant, New Mexico.
Status: Planned.
Project: 29 miles of 18-in. from Panoma Plant to Dumas Plant, Texas.
Status: Planned.
Project: 84 miles of 34-in. looping on San Juan main line and 21 miles of 30-in. looping on Permian-San Juan line.
Status: Planned.
Completion: June 30, 1957.
Project: 23 miles of 20-in. from South Andrews Station to Shell's TXL Plant, Texas.
Status: Planned.
Project: 9 miles of 16-in. from Shell's TXL Plant to Goldsmith Plant, Texas.
Status: Planned.
Project: 8 miles of 26-in. Southern System second loop west of Gila Station, Arizona.
Status: Planned.
Project: 28 miles of 10-in. in Nolan and Coke counties, Texas.
Status: Under way.
Contractor: **McVean & Barlow.**
Completion: January 1, 1957.

Fish-Service & Management Corp. (Agent for Cascade Gas Co.)
Project: City distribution system—205 miles of 1 to 8-in. in Washington and Oregon.
Status: Under way.
Contractor: **Ted Price Construction Co.,** Electric, Tex. Three spreads—M. E. Pulliam, spread superintendent, office at Walla Walla, Wash.; K. D. Garrett, spread superintendent, office at Pendleton, Ore.; E. E. Hanks, spread superintendent, office at Baker, Ore.
Completion: March 1957.

• **Houston Texas Gas & Oil Corp.**
Project: 960 miles of 26-in. between Baton Rouge, La., and Miami, Fla., plus 500 miles of sales laterals in Florida, with main line joining Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.
Status: Pending FPC approval.

• **Iron Ranges Natural Gas Co.,** St. Paul.
Project: 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minn.
Status: Application pending with FPC.

• **Kansas-Nebraska Natural Gas Co.**
Project: 61 miles of various size gathering line in Camerick field, Texas County, Oklahoma.
Status: Has FPC approval.

Michigan Consolidated Gas Co.
Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.;** Floyd Huduall, spread superintendent, office at Cadillac, Mich.
Project: 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.,** jointly with **J. L. Gentry Construction;** Frank Morris, spread superintendent, office at Hart, Mich.

• **Michigan Wisconsin Pipe Line Co.**
Project: 142 miles of loops in Wisconsin and Illinois.
Status: Under way.
Contractors: **H. C. Price Co.** and **Houston Contracting Co.** Price will build 56 miles of 24-in., and Houston will build 42 miles of 20-in. and 51 miles of 16-in. (being handled by Latex Construction Co. of Georgia), spread office at Fond du Lac, Wis.
Project: 31 miles of 6, 4-in. new and loop lines in Michigan and Indiana, and 24 miles of 24-in. looping in Wisconsin.
Status: Has FPC permit.
Completion: 1957.

• **Midwestern Gas Transmission Co.**
Project: Will build main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in., 648 miles of 3 to 18-in. extensions in Minnesota and Wisconsin.
Status: Application pending with FPC.

• **Mountain Fuel Supply Co.,** Salt Lake City.
Project: 38 miles of line to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.
Status: Has temporary FPC permit.

• **Natural Gas Pipeline Co. of America**
Project: 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex.
Status: Has FPC approval.
Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and for 91 miles of 30-in. loops along parts of its main line.
Status: Application pending with FPC.

New York State Natural Gas Corp.
Project: 9 miles of 20-in. in Indiana and Armstrong counties, Pennsylvania.
Status: Under way.
Contractor: **Harford Brothers.**
Completion: January 7, 1957.

Niagara Mohawk Power Corp.
Project: 272 miles of 2 to 12-in. distribution mains for growth of service area in central, eastern, and northern New York.
Status: Fifty per cent completed.
Contractors: Various.
Completion: December 31, 1956.

• **North Carolina Natural Gas Corp.** (Subsidary of Colonial Natural Gas Corp.)
Project: 575 miles of 3 to 16-in. from Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across north Carolina.
Status: Has permit from North Carolina Utilities Commission.

• **Northern Natural Gas Co.**
Project: 160 miles of 2, 3, 6, 8-in. branch lines to serve 20 new communities on Aberdeen, S. D., line.
Status: Under way.
Contractor: **Troth Construction Co.**
Project: 73 miles of 20-in. from Savana Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.
Status: Planned.

• **Offshore Gathering Corp.,** Houston.
Project: 364 miles in Gulf of Mexico off Louisiana.; 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in. (Dual line.)
Status: Application pending with FPC.

Pipeline Patrol

• **Ohio Fuel Gas Co.**
Project: 19 miles of 5, 12, 16-in. to replace or loop present facilities serving Dayton and Toledo areas, and extend service to McCutchenville.
Status: Pending FPC approval.

• **Pacific Gas & Electric Co.**
Project: 37 miles of 20-in., 37 miles of 18-in., 9 miles of 12-in. from Beehive Bend field near Willows, Calif., to near Davis, then to Sacramento.
Status: Under way.
Contractor: **Engineers Limited Pipeline Co.**
Project: 135 miles of 34-in. looping of the Topock-Milpitas line.
Status: Under way.
Contractor: A joint-venture firm, **Midwestern-Johnson-Dixon,** has 85 miles to complete this year.
Completion: Major part to be laid in 1956; 62 miles in 1957.
Project: 200 miles of 12-in. from Sacramento Valley gas fields to Humboldt County, California.
Status: Has filed for approval of California's Public Utilities Commission. To start early 1957.
Completion: December 1, 1957.

• **Pacific Northwest Pipeline Corp.**
Project: 37 miles of 6-in. from Dove Creek to Nucla, Colo., and 13 miles of 4-in. from Nucla to Urvan, to serve Union Carbide Nuclear Co. and Vanadium Corp. of America.
Status: Has FPC permit.

• **Peoples Natural Gas Co.**
Project: 4 miles of 12-in. from Evans City to Harmony, Pa.
Status: Planned. FPC permit not required.
Completion: January 1, 1957.

• **Permian Basin Pipeline Co.**
Project: 83 miles of 16-in. from its Spraberry station in Midland County, Texas, to tie in with Pioneer Gathering System, Inc., at a point in northwestern Schleicher County, Texas.
Status: Filed for FPC approval.

• **Piedmont Gas Co.,** Hickory, N. C. (Parent is Carolina Natural Gas Corp.)
Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.
Status: Application pending with FPC.

• **Pioneer Gathering System, Inc.**
Project: 27 miles of 16-in. and 27 miles of 12-in. in Schleicher and Sutton counties, Texas.
Status: Filed for FPC approval. Estimate to start work March 1, 1957.
Completion: July or August 1957.

Southern California Gas Co. and Southern Counties Gas Co. of California.
Project: 241 miles of 30-in. from the outskirts of Los Angeles to Topock on the Arizona-California border.
Status: Right-of-way and ditch under way; pipe laying begins in January, 1957.
Contractor: **R. H. Fulton & Co.**
Completion: June 30, 1957.

• **Southern Natural Gas Co.**
Project: 24 miles of 12-in. from Lake Enfermer to Gloria, La.
Status: Approved.
Completion: January 1, 1957.
Project: 10 miles of 8-in. gathering lines between Napoleonville and Fort Jackson, La.
Status: Pending FPC approval.
Completion: August 1, 1957.

Spokane Natural Gas Co.
Project: 400 miles of 1 through 24-in. distribution system at Spokane.
Status: Under way.
Contractor: **Hallmac Construction Co.;** V. L. Williams, spread superintendent, office at Spokane.
Completion: 1957.

• **Tennessee Gas Transmission Co.**
Project: 221 miles of 30-in., 101 miles of 26-in., and 10 miles of 24-in. looping from Portland, Tenn., to Greenup, Ky.; from Morehead, Ky., to Catlettsburg, Ky.; from Catlettsburg to Broad Run, W. Va.; from New Wilmington, Pa., to Mercer, Pa.; and from New Castle, Pa., to near Pittsburgh, Pa.
Status: Pending FPC approval.
Project: 51 miles of 26-in., 51 miles of 20-in., and 17 miles of 12-in. gathering lines from Kinder, La., to offshore fields in Gulf of Mexico.
Status: Pending FPC approval.
Project: 577 miles of 30-in. from Mississippi River delta area south of New Orleans to Portland, Tenn.
Status: Pending FPC approval.
Project: 76 miles of 24-in. between Coudersport, Pa., and Hamburg, N. Y.
Status: Pending FPC approval.

• **Texas Eastern Transmission Co.**
Project: 422 miles of 30-in. from near McAllen to Beaumont, Tex., to move imported Mexican gas; 45 miles of 24-in. laterals from McAllen to Provident City, Tex., 77 miles of 30-in. looping between Kosciusko, Miss., and Uniontown, Pa.; 147 miles of supply and sales laterals.
Status: Under way.
Contractor: **Houston Contracting Co.** has 121 miles of 30-in. between Angleton and Vidor, Tex., to start March 1, 1957. **H. C. Price Co.** has 70 miles of 30-in. **H. B. Zachry Co.** has 201 miles of 30-in. starting near McAllen and running northeast to near Angleton, Tex. **Grayco Constructors, Inc.** has 45 miles of 24-in. laterals from Blessing to Provident City. **Western Pipe Line, Inc.,** Austin, has 30-in. crossings at Nueces, Lavaca, and Carancahua bays. **Missouri Valley Dredging Co.,** Omaha, has crossings at Hinds and Guadalupe bays.
Completion: Fall 1957.

• **Trans Carolina Pipe Line Corp.,** Commercial Building, Raleigh, N. C.
Project: 300-mile system across North and South Carolina, plus 500 miles of laterals.
Status: FPC approval pending

• **Transcontinental Gas Pipe Line Corp.**
Project: 25 miles of 36-in. loops from Louisiana to South Carolina, 31 miles of 36-in. and 43 miles of 30-in. line.
Satus: Pending FPC approval.

Foreign Crude-Oil Pipelines

Arabian American Oil Co.
Project: 140 miles of 20-in. from Safaniya field in the Persian Gulf to Ras Tanura, Saudi Arabia, plus an 8-in. gathering system in the gulf.
Status: Under way.
Contractor: **International Bechtel Brothers, Inc.**
Completion: April 1, 1957.

Bolivian Gulf Oil Corp.
Project: 160 miles of 10-in. and 43 miles of 8-in. from Sicascia to Arica on the Chilean coast.
Contractor: **Williams Brothers Co.**
Completion: December 1957.

• **B-A Alberta Pipe Line, Ltd.**
Project: 35 miles of 8-in. to connect Drumhell field, Alberta, with existing lines running to Edmonton.
Status: Pending approval.

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Pipeline Patrol

• **Interprovincial Pipe Line Co.**
Project: 151 miles of 20-in. to extend present line from Sarnia to Port Credit, Ont.
Status: To start May 1957.
Completion: October 1957.

• **Iraq Petroleum Co.**
Project: About 600 miles of up to 40-in. from Kirkuk field through Iraq and Turkey to the Turkish port of Iskenderun on the Mediterranean sea.
Status: Proposed. Survey completed.

• **Mene Grande Oil Co.**
Project: 11 miles of 6-in. from Elias to Fria, and 10 miles of 10-in. from Limon to Leona-Dacion lateral, Venezuela.
Completion: First quarter 1957.

• **North-West Oil Pipelines Co.** (newly formed by six West German refiners, headed by affiliates of Standard Oil Co. (N.J.), and British Petroleum Co., Ltd.)
Project: 210-mile line from the refining centers in the industrial Ruhr area of West Germany to Wilhelmshaven.
Status: Planned.
Completion: 1959.

Pembina Pipe Line, Ltd.
Project: 100 miles of 3 to 10-in. gathering system in Pembina field.
Contractor: **Sparling Davis Co., Ltd.**
Project: 200 miles of 3 to 12-in. gathering line in Pembina oil field.
Contractor: **Mannix, Ltd.**; F. Whitlow, spread superintendent, office at Pembina oil field.

• **Range Land Pipe Line Co.**
Project: 46 miles of 12-in. between Sundre and the Sylvan Lake in south-cenrtal Alberta.
Status: Approved. Surveys under way.

• **Royal Dutch-Shell**
Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, and Netherlands, and Belgium. Main trunk to be 30-in.
Status: Company is considering project together with several other companies.

• **Sinclair Oil Corp. and Socony Mobil Oil Co.**
Project: 211 miles of 20-in. from the Silvestre field in Barinas, Venezuela, to Puerto Cabello on Caribbean Sea.
Status: Under way.
Contractor: **Williams Brothers Sudamericano, Ltd.**

Union of Soviet Socialist Republic
Project: 2,300-mile Trans-Siberian crude and products line from Ufa and the Tuimaza fields in Bushkiria to Irkutsk near Lake Balkal.
Status: Under way.

• **Westspur Pipe Line Co.**
Project: 20 miles of 12-in. from Alida in southeastern Saskatchewan, to the Carnduff-Glen Ewen area to tap Cantal, Hastings, Florence, Carnduff, and Glen-Ewen fields; 34 miles of 4, 6, 8-in. gathering lines.
Status: Planned. Has requested permit from Board of Transport Commissioners.

Yacimientos Petrolliferos Fiscales (Argentina)
Project: 700 miles of 12-in. from Campo Duran to San Lorenzo.
Status: Under way.
Contractor: **TECHINT** (Compania Tecnica Internacional), Buenos Aires, has 90 miles.

Foreign Products Pipelines

Hydrocarbons Pipeline Co. (Subsidiary of Canadian Hydrocarbons)
Project: 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Fort William, Ont.
Status: Has permit from Parliament of Canada. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board, work will start early 1957.
Construction consultants: **Dutton-Williams Brothers, Ltd.**, Calgary, and **A. D. Little & Co.**, Boston.

• **Iraq Petroleum Co., Ltd.**
Project: 75 miles of 24-in. from Homs, Syria, to Tripoli, Lebanon.

Israeli Government
Project: A 6-in. line from the Haifa refinery to Tel Aviv.
Completion: Late 1957.

National Iranian Oil Co.
Project: 573 miles of 10-in. from Ahwaz to Teheran, Iran.
Contractor: **Enterpose of Paris,** has northern 236 miles. Southern section completed.

• **North Atlantic Treaty Organization (NATO)**
Project: 2,000 miles of lines to airfields in parts of Europe.
Status: Under way.
Contractors: **Associated Pipeline Contractors, Inc.,** has 450 miles from Iskenderun, Turkey, to Batman. **TECHINT** (Compagnia Tecnica Internazionale), Milano, Italy, has 205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir. Bids were taken in January 1956 on 300 miles of 12-in. between Marseille and Langres, France. Taking bids on 275 miles in northwestern France: 54 miles of 2-in. from Langres to Mirecourt, 63 miles of 2-in. from Mirecourt to Phalsbourg, 47 miles of 8-in. from Mirecourt to Metz, 30 miles of 8-in. from Phalsbourg to Deux Ponts, 35 miles of 8-in. from Phalsbourg to Strasbourg.

United States Defense Department
Project: Sponsoring 485 miles of 8, 10, 12-in. from Cadiz to Zaragoza, Spain.
Contractors: Prime contractor — **Brown-Raymond-Walsh; Merritt Chapman & Scott,**

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Pipeline Patrol

Benson & Montin of Oklahoma City, **Agroman Construcion Co.** of Spain.

Foreign Natural-Gas Pipelines

• **Alberta Gas Trunk Line Co., Ltd.**

Project: 637 miles of 34 to 16-in. gathering lines in Alberta.

Contractor: **Dutton-Williams Brothers, Ltd.,** has preliminary studies, design and management-engineering. **Mannix, Ltd.,** has crossing of Red Deer River near Cavendish, Alta.

Status: To start in 1957.

Andes Pipeline Corp. (Subsidiary of Glenn McCarthy, Inc.)

Project: 500 miles of 12-in. from McCarthy's Bolivian concession to the Chile copper-mining area.

Contractor: Will do own work.

• **Attock Oil Co.**

Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.

Status: Planned.

Cia. Shell de Venezuela.

Project: 177 miles of 20-in. from La Paz field in the Maracaibo district, to the Cardon refinery on Paraguana Peninsula, to fuel refinery furnaces.

Status: Under way.

Completion: 1957.

• **Empresa Nacional Del Petroleo.**

Project: 80 miles of 10-in. from Concon to Santiago, Chile.

Status: Planned.

Imperial Oil, Ltd.

Project: 37 miles of 12-in. from Waterdown to North Toronto, Ont.

Status: Under way.

Contractor: **Majestic Contractors, Ltd.,** Odis Hare, spread superintendent, office at Cooksville, Ont.

Inland Natural Gas Co., Ltd.

Project: 350 miles of 12 to 4-in. system in British Columbia, and 400 miles of distribution piping in 31 towns.

Status: Clearing and grading under way.

Contractor: **Dutton-Williams Brothers, Ltd.;** Pat Campbell, project manager, office at Penticton.

Completion: September 1957.

Petroleos Mexicanos

Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey in northern Mexico.

Status: Planned.

South Alberta Pipe Line, Ltd.

Project: 150 miles of 8-in. from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta.

Status: Filed for permit.

Sui Gas Transmission Co.

Project: 188 miles of 16-in. from Sui gas field to Moultan, Pakistan.

Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang, Magiana, and Montgomery.

Contractors: **Pakistan Constructors,** a joint company of **Morrison-Knudsen** of Boise, Idaho, and **William Press, Ltd.,** of London.

• **Technical Office of Hydrocarbon. Ministry of Mines and Petroleum, Government of Venezuela.**

Project: 321-km., 26-in. line from Anaco to La Mariposa near Caracas.

Status: Proposed.

• **Trans-Canada Pipe Lines, Ltd.**

Project: 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg. (First part of 2,250-mile line from Alberta to Toronto and Montreal.)

Status: Under way.

Contractors: **Majestic Contractors, Ltd.** (104 miles from Burstall to Stewart Valley, Sask., R. L. Leaonard, spread supt., office at Cabri.; **Canadian Bechtel, Ltd.** (110 miles from Swift Current to Moose Jaw, Sask., J. L. Work, general supt., office at Moose Jaw, and 54 miles from Partoze La Prairie to Winnipeg); **Mannix, Ltd.** (90 miles from Moose Jaw to Welseley, spread superintendent, T. Anderson, office at Montmartre, Saskatchewan); **Dutton-Williams Brothers, Ltd.** (87 miles from Deveren to Moosomin, to start in 1957). **Price-Poole of Canada, Ltd.** has 100 miles from Miniota to near McGregor to start in 1957.

Completion: Late summer 1957.

Union of Soviet Socialist Republic.

Project: 900 miles of 26-in. from Stavropol in the Northern Caucasus to Moscow. The line, larger than Russia's other two major gas lines which are only 16 and 18-in., will serve Voroshilovgrad, Voronezh, Tula, Yelets, and Serpukhov.

Status: Under way; approximately 50 per cent completed.

Westcoast Transmission Co., Ltd.

Project: 650 miles of 30-in. from Peace River area, Canada, to Sumas, Wash.

Status: Under way. About two-thirds completed.

Contractors: **Dutton-Williams Brothers, Ltd.,** has 120 miles from Taylor, B. C., to Azouzetta Lake, T. E. Davis, spread supt., office at Dawson Creek, B. C.; **Mannix, Ltd.,** has 110 miles between Huntingdon and Merritt, Fred Byers, spread superintendent, office at Chilliwack; **Canadian Bechtel, Ltd.,** has 210 miles from Alexandria to Pine Pass, B. C., H. F. (Hank) Mogg, spread man, office at Quesnel, B. C.; **R. A. Conyes Construction Co.,** has 210 miles; **River Construction Corp., Ltd.,** has under way 150 miles of gathering lines in northern Alberta and British Columbia.

Completion: Dutton-Williams section to be completed November 1957, R. A. Conyes section and Canadian Bechtel section to be completed September 1957.

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Showcase

OF NEW EQUIPMENT AND LITERATURE

by Dan B. Miller

Flange Protects Pipe Where Hooked to Heavier Valves

A 125-lb. taper-face lightweight welding-neck flange serves where lighter-schedule pipe must be connected to 125-lb. cast-iron valves and other equipment. The flange overcomes two difficulties. (1) Its tapered face causes greater pressure to be exerted near the bore. This eliminates the usual problems met in obtaining a leakproof seal when a conventional flange with a full-face gasket is used. (2) Strain-gage tests have shown that the new flange, equipped with a full-face gasket, can be safely bolted to cast-iron or semisteel flanges. It will not overstress or crack them, nor the integrally cast valves, pumps, and other facilities they may serve. Also, hydrostatic tests indicate that when the new flange is properly used the joint can withstand three times the pressure it could contain if the taper was omitted.

The new flange is rated at 125 lb. for water, oil, and gas service. It matches 125-lb. cast-iron flanges and valves made to A.S.A. B16.1, and the bolt circle and drilling are the same as employed for A.S.A. 150-lb. standard steel flanges. **Write or call: Tube Turns, 224 East Broadway, Louisville 1, Ky., for more information on the 125-lb. taper-face welding-neck flange.**

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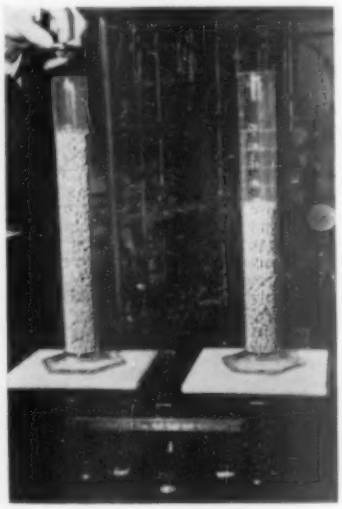

New Catalyst Offers High Active-Metals Content

A new petroleum-refining catalyst for the removal of sulfur from hydrocarbons is called Aero HDS. The new product, a cobalt-molybdena catalyst, reduces the sulfur content of petroleum fractions by conversion to hydrogen sulfide. The catalyst has high-volume activity and excellent mechanical properties.

Refiners utilizing the new product can expect long on-stream service life due to slow blocking of internal working surfaces, laboratory-test reports indicate. It has a high active-metals content, good porosity, and a low bulk density.

Actual plant experience with Aero HDS shows that at 80 per cent removal, 40 per cent more naphtha can be treated over a given weight of catalyst. Or, a refiner can treat a given base amount of naphtha with up to 30 per cent less catalyst. Nitrogen-removal efficiency has also been evalu-

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to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in boldface type at end of description.

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ated on a relative basis. Resulting data shows Aero HDS to be more effective than many existing catalytic compounds.

Designed for service in both new and existing facilities, the product also lends itself to regeneration during use. Preliminary tests on a laboratory scale, using air under closely controlled temperature conditions, indicate that catalyst activity is not adversely affected by regeneration, while mechanical properties are only slightly influenced. **Write or call: American Cyanamid Co., Refinery Chemicals Department, 30 Rockefeller Plaza, New York 20, N. Y.**

●

Vibrometer Measures Vibration on Rotating Shaft

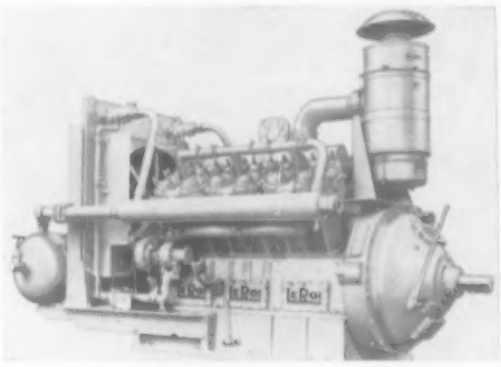
The Vibrometer Model P has been modified so that the glass scale has equal visibility for vertical and horizontal vibration readings. The scale now slopes at an angle of 30° instead of being mounted horizontally as in previous models. The instrument measures vibration amplitude on machine structures. Measurements can also be made directly on the surfaces of rotating shafts by means of an integral probe. A light beam for a lamp powered by self-contained dry cells is reflected on a graduated ground-glass scale where the amplitude indication appears as a band of light. The instrument is available in magnifications of 125:1, 250:1, and 500:1. **Write or call: Vibroscope Co., Route 28, P. O. Box 97, Glenford, N. Y., for more information on the Vibrometer Model P.**

●

Radioactive Tracers Assist In Well Logging, Refining

Radioactive tracers in the form of tagged oil solutions or water solutions, particles of various mesh sizes and densities, and gases are now offered as commercial items. These radioactive tracers will be of value to the oil industry in such uses as well logging, catalytic attrition, mixing efficiency, and in flow tracing and measurement. **Write or call: Isotopes Specialties Co., Inc., 703 South Main Street, Burbank, Calif., for more information on radioactive tracers.**

OIL AND GAS JOURNAL *Showcase* ..... OF NEW EQUIPMENT



Compressors Designed for Air Drilling

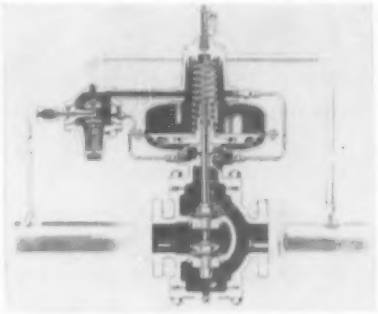
A line of air-drilling compressors includes three models. The smallest, the 200S1, is a single-stage machine with a rated capacity of 620 cu. ft. per minute at 100 psi. and 870 r.p.m. The bare unit is 80 in. long, 54½ in. wide, and 82 in. high. Its dry weight is 6,025 lb.

The 300S1 is also a single-stage machine and has a free-air delivery capacity of 930 cu. ft. per minute at 100 psi. and 870 r.p.m. It is 100 in. long, 54½ in. wide, and 82 in. high. Dry weight for the 300S1 is 7,450 lb.

The largest of the new air-drilling compressors is the 350S2 which is a two-stage unit. It has a free-air delivery capacity of 850 cu. ft. per minute at 250 psi. and 870 r.p.m. Its dry weight is 7,600 lb.

The compressors are equipped with oil filters and water-cooled discharge manifolds. Overheating is not a problem and oil consumption is low. Other features include generous crankshaft and bearing surfaces, conservative speeds (870 to 900 r.p.m.) and sufficient intake-air cleaning capacity for very dusty conditions. **Write or call: Le Roi Div., 5000 Forty-fifth West Avenue, Tulsa, Okla., for more information on air-drilling compressors.**

●



250-Psi. Gas Regulator Is Stable and Sensitive

A new ultrasensitive gas regulator, Type 298T, is used as an intermediate or low-pressure district regulator on gas-distribution systems and as an industrial regulator where the inlet pressure does not exceed 250 psi.

The diaphragm casing for the regulator is made of deep-drawn steel. It has a large capacity which promotes stability and sensitivity of control. A glass-enclosed travel indicator is available which shows the position of the inner valve at all times. A tapered lock is used in the stem connection. The stem is screwed and clamped to resist shaking and vibration. Maximum inlet pressure is 250 psi. Controlled pressure range is from 5-in. water column to 65 psi. **Write or call: Fisher Governor Co., Marshalltown, Iowa, for Bulletin P-298-C.**

●

Weed Killer Reduces Fire and Safety Hazards

A dry, granular weed killer, H-174, is nonselective, as it kills all vegetation. It is designed for industrial use only. It kills weeds wherever they are a fire or safety hazard, as around warehouses, oil and chemical-storage tanks, power lines, pipelines, and loading docks.

H-174 is applied directly from a

OIL AND GAS JOURNAL Showcase

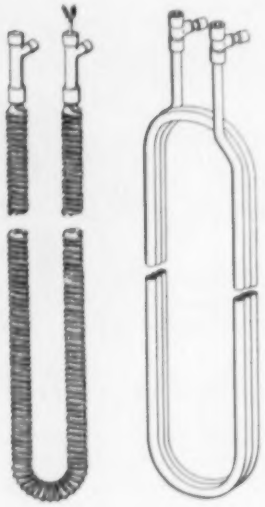
.....OF NEW EQUIPMENT

shaker package, or with ordinary seed sowers or fertilizer spreaders. No power spraying equipment is needed. A normal dosage is 200 to 400 lb. per acre. When H-174 is applied just prior to the growing season, it will kill seedings and prevent complete germination of seeds, thus eliminating dead-weed debris that results from mid or late-season application. **Write or call: National Aluminate Corp., 6216 West Sixty-sixth Place, Chicago 38, Ill., for more information on Nalco H-174.**

•

Columns and Adsorbents for Chromatographic Analysis

Standardized fractionating columns and adsorbents are offered for use in the analysis of gases and liquids by chromatographic methods. Fractionating columns are available in glass or metal, filled with adsorbent or unfilled, equipped or not with heating coils, and with or without thermocouples plus accessory equipment for temperature control. All columns are equipped with quick make-and-break connectors and are easily interchangeable.



Adsorbents are offered in two classifications: solid or surface types for the analysis of gases, and partition types for liquids. Inert powders, properly sized, are available to laboratories interested in preparing their own adsorbents for analysis by partition. **Write or call: Burrell Corp., 2223 Fifth Avenue, Pittsburgh 19, Pa., for Bulletin No. 834.**

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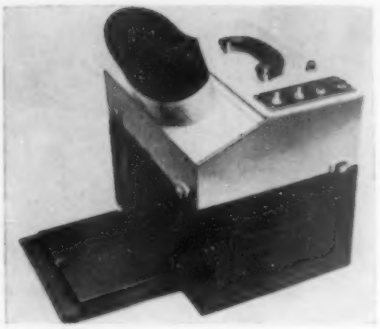

Mineralab Offers Handy Core Inspection At the Rig

A portable ultraviolet fluorescense-analysis cabinet allows on-the-spot inspection. Mineralab provides short-wave ultraviolet, long-wave ultraviolet, and white light all in one portable darkroom. It offers handy core inspection at the rig or in the open laboratory. It is used for chromatographic analysis and nondestructive testing of minerals and chemicals. **Write or call: Black Light Eastern Corp., 33-00 Northern Boulevard, Long Island City 1, N. Y., for more information on the Mineralab inspection cabinet.**

•

Resistivity Meter Measures Mud, Mud Cake, and Filtrate

Model 88 resistivity meter is small and light. It measures 3 by 4 by 5 in. and weighs 20 oz. Carried like a camera, it measures resistivity of any liquid or plastic sample with accuracy to 2 per cent. The instrument is direct-reading—there is no booger factor for either cake or filtrate. All electronic parts are moisture and fungusproof.

The transparent sample holder functions with samples as small as 0.75 cc. and is easy to clean. Battery power is self-contained, with battery life from 3 to 5 years in normal usage. Circuits are transistorized for compactness and long life. A leather carrying case is available. **Write or call: Fann Instrument Corp., Box 6101, 3202 Argonne Street, Houston, Tex., for more information on the Model 88 resistivity meter.**

•

Fluorimeter Works Over Wide Range of Temperatures

The Model FL-210 Fluorimeter is an instrument for the quantitative analysis of uranium minerals, and for uranium determinations in geobotanical, hydrogeochemical, and geochemical prospecting. This fluorimeter works

over a wide range of ambient temperatures and input voltages and thus is suitable for both field and laboratory use. A balanced vacuum-tube microammeter circuit protects the hermetically sealed galvanometer regardless of range setting and sample concentration. A dial reads in micrograms. **Write or call: Mount Sopris Instrument Corp., 1320 Pearl Street, Boulder, Colo., for more information on the Model FL-210 Fluorimeter.**

OIL AND GAS JOURNAL *Showcase* .....OF NEW EQUIPMENT

Catalytic Purifying and Reactivating Dryers Combined

A new gas-purifying and drying unit combines catalytic purifying with reactivating dryers in one assembly. Called the Deoxo Puridryer MS, it has applications in the chemical and petroleum industries, as well as in experimental laboratories. The new unit uses a molecular sieve in place of previously used activated alumina to register gas dew-point readings of better than — 100° F.

In a typical application, the Deoxo Puridryer MS feeds dry ogygen-free hydrogen (less than 1 part oxygen per million parts hydrogen) into an atmospheric furnace at a maximum rate of 100 cu. ft. per hour. Capacity depends upon the moisture content and the impurity of the incoming gas.

Other gases such as nitrogen, argon, neon, and saturated hydrocarbons can be dried and purified similarly, provided that a ratio of two volumes of hydrogen to one of oxygen is always present for the catalytic reaction. **Write or call: Baker & Co., 113 Astor Street, Newark, N. J., for more information on the Deoxo Puridryer MS.**

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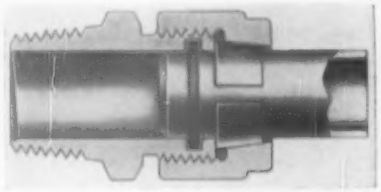
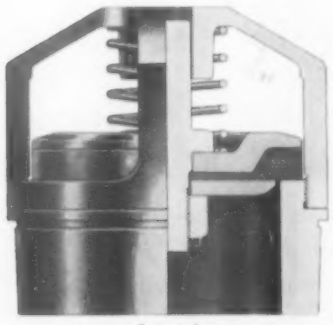
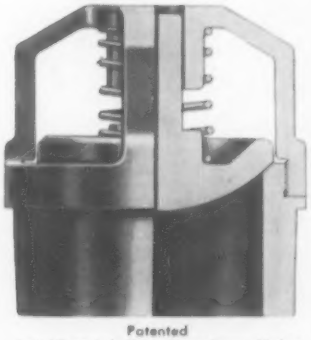


Only Hacksaw and File Needed for Tube Connection

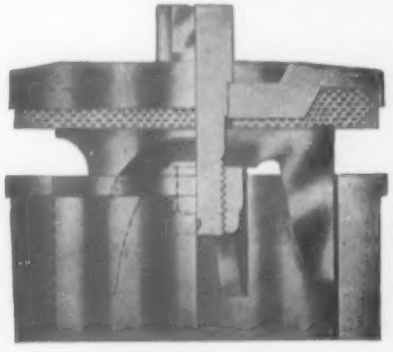
The Lenz-O-Ring tube fittings eliminate flaring, threading, welding, and soldering when joining tubes. Only tools needed are a hacksaw and a file. The fittings are made of cadmium-plated steel and will serve with hydraulic fluids up to 2,500 psi. at 275° F. They conform to J. I. C. hydraulic standards. They offer simple, leak-



Patented
L-K Flat Insert, Cage Type Pump Valve
Style 108



Patented
L-K All Metal, Cage Type Pump Valve
Style 106



Patented
L-K Regular Slush Pump Valve
Style 102

L-K PUMP VALVES FOR EVERY OIL INDUSTRY SERVICE

The L-K Pump Valve Company has been in business for more than twenty-six years. During that time we have furnished valves for many different types and makes of pumps operating under almost every conceivable condition. We have never found a condition too hard to tackle. We know of no pump valve problem given us that we have failed to solve, nor of any customer that we failed to satisfy. We have accumulated drawings of practically every different kind and size of pump valve that we have ever manufactured and a vast amount of fluid end pump information.

In this business we have learned that there is no "all purpose pump valve," although under **some conditions** almost any valve will give reasonably good service. This is the principal reason why we have so many different kinds, types, and combinations of valves of our own design. If you will give us complete information concerning the conditions under which your pump is operating, we will recommend the proper valve or combination of valves to give you the most economical operation and efficient service. These recommendations are based on actual experience.

L-K PUMP VALVE COMPANY

632-40 No. Edgewood St. **P. O. Box 901, Houston 1, Texas** **Phone WAlnut 6-2623**

proof connections for steel or copper tubes on air, refrigerant, and hydraulic systems. When joining tubes with these fittings, exact length is not necessary. Neither is it necessary to cut the tube square. Sizes of the fittings, including tees, unions, and reducer couplings, range from ¼ to 2 in. **Write or call Lenz Co., Box 1044, Dayton, Ohio, for more information on Lenz-O-Ring tube fittings.**

Portable Millivoltmeter Has Eight Scale Ranges

A new, portable vacuum-tube millivoltmeter gives direct, accurate, in-the-field measurements of very small potentials. Battery operated, it measures small potentials associated with corrosion problems, and electrochemical and geophysical tests. Essentially infinite input resistant, 10 megohms, on all ranges provides minimum disturbance to the circuit under test. Six full-scale ranges between 0-25 and 0-1,000 mv. and two additional ranges, 0-10 and

0-100 volts, are provided. Scale divisions are divided on the 0-25-mv. scale so that measurements to 50 mv. are possible. This new instrument is available in both d.c. and a.c. models.

A new circuit provides stable, reliable all-electronic measurements. Instrument accuracy ±1½ per cent on all ranges, is independent of tube and battery variations. **For more information write or call: Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif.**

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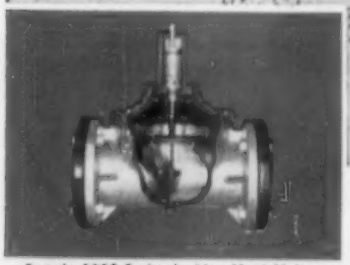
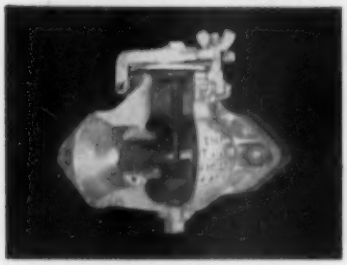


Enardo 1900 Series In-Line Vent Valve



Enardo 800 Series In-Line Vent Valve

Are you still looking in the sky for profit losses? Enardo Vent Valves provide a means of keeping a predetermined pressure on stock tanks. These vent valves are used in conjunction with Enardo pressure type hatches. Set 2 to 4 ounces less than hatch pressure to prevent hatch venting.

On leases not using a positive venting system, that have changed to an Enardo Vapor Control System, it has been proven that there was an immediate increase in saleable fluid gravity. For, on a lease with a production of 50 barrels per day, it is possible to add a total savings of $1,482.00 in the books after the installation of proper hatches and vent valves, cutting gravity and volume loss.

Enardo 800 series Vent Valves are offerred in standard 2", 3" and 4" pipe sizes, pressure settings ½ to 16 ounces. Featuring aluminum or semi-steel bodies with plastic trim. Slip-On or flanged ends. Standard valve is 1 ounce pressure, 4/10 ounce vacuum.

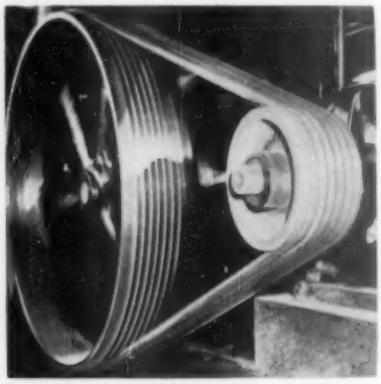
Enardo 1900 series Vent Valves also offered in 2", 3" and 4" sizes, with or without companion flanges bolted on. Standard valve 2 ounce pressure, 4/10 ounce vacuum. Pressure settings from 2 to 24 ounces.

Contact the representative nearest you for further information.

Jack Merrill	Harry Higginbotham
Henderson, Texas	Tulsa, Oklahoma
W. R. Lee	K. S. Drane
Midland, Texas	Houston, Texas
Jack D. Neff	Bruce Heller
Ellinwood, Kansas	Tulsa, Oklahoma

ENARDO manufacturing company

BOX 1647 TULSA, OKLA



New V-Belts Allow Narrower Sheaves and Fewer Belts

The new Powerflex Hi-capacity V-belt has up to 40 per cent more strength than standard belts. It features a special oil-resistant cover to prolong belt life and is available in all standard sizes. Lower drive costs can be achieved since fewer belts and narrower sheaves are required to handle a load. Bearing life is increased because of lighter weight and lower stresses.

The Powerflex Hi-capacity V-belt can be furnished with static conducting covers. A and B-section belts are manufactured with nylon-laminated construction and C, D, and E sections are of heavy-rayon-grommet construction. **Write or call: Thermoid Co., 200 Whitehead Road, Trenton, N. J., for more information on Powerflex Hi-capacity V-belts.**

OIL AND GAS JOURNAL

Showcase

- BULLETINS
- CATALOGS
- BROCHURES

Guiberson Oil-Field Equipment Catalog. A new 160-page catalog contains descriptions, detailed engineering data, parts price lists, and illustrations of oil-field equipment. Each listed item is priced and identified by individual part number. Exploded parts drawings assist in quick identification of replacement parts. Setting and removal procedures are clearly outlined and a surface setting stroke table provided for each type of packer offered. **Write or call: The Guiberson Corp., Dallas, Tex., for Guiberson 1957-1958 Oil-Field Equipment Catalog.**

●

Columbia Activated Carbon is discussed in the eight-page, illustrated Catalog S-6450. The booklet explains the properties of activated carbon that make it a good adsorbent. It deals with adsorption as a unit operation in processing. Separate sections discuss the use of activated carbon for gas purification and separation, and as catalysts or catalyst carriers. The booklet covers its use in the storage of gases, in chromatographic separations, and other chemical and industrial processes. **Write or call: National Carbon Co., 1300 Lakeside Avenue, Cleveland 14, Ohio, for Catalog S-6450.**

●

Super 70 Series Control Valves. Catalog 70-11 is a two-color, four-page folder that covers control valves offering a wide selection of flow characteristics for processing gas, steam, or liquid flow. The folder includes cutaway and schematic drawings of the valve parts, accessories, and pilots. The valves are of cast iron or steel and have ratings through 600 A.S.A. **Write or call: Black, Sivalls & Bryson, Inc., Controls Division, P. O. Box 1529, Tulsa, Okla., for Catalog 70-11.**

●

Reliance Motor Selector, a new 12-page, 2-color bulletin, gives information on how to select alternating current motors for specific applications. Included in Bulletin B-2103-1 are such comprehensive selection data as speed-frequency relationship, N.E.M.A. design classes, torque characteristics, N.E.M.A. current and torque values, frame selection tables, dimension charts, and mechanical modifications for all frame sizes from 182 to 6085. Two pages are devoted to a pictorial glossary of motor-enclosure terminology. **Write or call: Reliance Electric & Engineering Co., 1088 Ivanhoe Road, Cleveland 10, Ohio, for Bulletin B-2103-1.**

●

Fisher/Tag Flash Point Testers. Bulletin FS-260 presents information on a line of testers designed to reproduce the required heating rate, size of test flame, and the proper method of introducing the flame to match the specifications for flash-point testing of the American Society for Testing Materials. The bulletin describes each tester as to the tests it can make. It includes photographs, drawings, an accessory list, and prices. **Write or call: Fisher Scientific Co., 717 Forbes Street, Pittsburgh 19, Pa., for Bulletin FS-260.**

●

Parsons 155 Utility-Size Trenchliner is described in a new 16-page, 2-color catalog. Photographs and drawings detail principal construction and application features of the 155 Trenchliner. With its 7-ft. 4-in. height and 5-ft. 4-in.

competition *makes it better!*

Merry Christmas and a Happy New Year!

Engineered answers to oil well cementing | **BJ SERVICE, INC.**

width measurements, the compactness of this Trenchliner allows it to operate in congested areas. The 155 is capable of producing from 5.8 in. to 12.75 lineal ft. of trench per minute in a range of 30 digging speeds selected by lever control. **Write or call: Parsons Co., Newton, Iowa, for more information on the 155 Trenchliner.**

●

Hand-Cranked Inertia Starters, distributed by Bendix International, offers a simple and dependable starting device which can be fitted to most engines. It is described in the three-color folder APB-656. The starter is simple to operate. First, a hand crank is turned for 60 to 80 seconds and then removed. Then a hand lever engages the flywheel and the inertia spins the engine. There are no batteries, dynamos, motors, or electrical parts. **Write or call: L. K. Klein, Air Pumps, Ltd., Bushey Road, Raynes Park, London S. W. 20, England, and ask for inertia starter folder APB-656.**

●

Econ-O-Max for Low-Temperature Separation is the title of Catalog 33-01A. The Type B Econ-O-Max operates on small gas-condensate wells which have low-flowing temperatures and a low production rate (½ to 3 M.M.s.c.f.d.). It consists of a compact, vertical separator with internally located liquid-level controllers and effective gas scrubbing. It employs internal-heating coils to melt hydrates and warm liquid to reduce light-hydrocarbon-fraction content. The automatic unit fits any well-stream analysis and provides increased condensate recovery for small gas-condensate wells. **Write or call: Black, Sivalls & Bryson, Inc., Product Information Dept., 7500 East Twelfth Street, Kansas City 26, Mo., for Catalog 33-01A.**

●

The Service-Score System for Controlling Wire-Rope Costs is the subject of a new illustrated folder. Described is an easy method of fact finding to increase wire-rope operating efficiency and help to reduce supply and maintenance costs. A sample set of service-score stickers is sent with the folder. **Write or call: Leschen Wire Rope Div., H. K. Porter Co., Inc., 2727 Hamilton Avenue, St. Louis 12, Mo., for Service-Score System folder.**

●

Servcoloy Catalog. A new three-color, eight-page catalog describes Servco's new Servcoloy process of oil-well milling, and the tools, such as section mills, whipstock mills, liner mills, junk mills, and rotary shoes which use the process. **Write or call: Servco Corp., 2450 Cerritos Avenue, Long Beach 6, Calif., for the Servcoloy Catalog.**

●

B. F. Goodrich Dock Loading Hose and Fittings are covered in a four-page illustrated data sheet. The publication provides technical information on construction, specifications, and recommended uses (including handling gasoline and oil). Data on fittings are also provided on a separate data sheet, which describes the various types of couplings, including new forged-aluminum nipples and flanges and new lightweight-steel nipples and flanges. **Write or call: B. F. Goodrich, Akron, Ohio, for Data Sheets 4100 and 4120.**

●

New Type C Otis Gas Lift Valve Cuts Production Costs and Workover Worries is the title of this two-color fact sheet. The valve is simple, having only 17 parts and no metal moving parts to jam or sand-lock. It can be used for continuous or intermittent flow and for dual completion—either conventional or parallel strings. Sizes range from ¾ to 1¾ in., to 2½ to 4 in. The fact sheet includes a labeled cutaway drawing. **Write or call: Otis Pressure Control, Inc., P. O. Box 7206, Dallas, Tex., for the Type G Otis Gas Lift Valve fact sheet.**

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. . . but moisture
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Get complete information now by writing for Bulletin 3019-DGJ or call your R&M representative.
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EQUIPMENT MEN . . . in the News

NBT Directors Announce Executive Appointments

A. E. BRADSHAW

Following the December meeting of the directors of National Bank of Tulsa, announcement was made of the elevation of A. E. Bradshaw from president to vice chairman of the board and chief executive officer; W. A. Brownlee from executive vice president to president; and F. C. Broach from senior vice president to executive vice president. In addition, two vice presidents, E. L. Stucker and Marvin Millard, were made senior vice presidents.

W. A. BROWNLEE

F. C. BROACH

Bradshaw began his banking career as a clerk in the City National Bank in 1901. Later he joined with associates to organize the Bank of Oklahoma. This bank in turn purchased the controlling interests in the First National Bank in 1911, retaining the latter name for the merged bank. Bradshaw was serving as its executive vice president in 1933 when he resigned to accept the presidency of the Oklahoma Natural Gas Co. of which he still is a director. In 1934 Bradshaw was elected president of National Bank of Tulsa, a position he has held since that time.

E. L. STUCKER

M. MILLARD

Brownlee began his banking career in Tulsa in 1910 as bookkeeper and clerk in Merchants & Planters State Bank, later to become the Planters National Bank of Tulsa. Brownlee was serving as vice president and cashier of this bank when the Planters National was bought by the former Exchange National. He has been executive vice president of National Bank of Tulsa since 1933.

Broach began his banking experience in the trust department and became assistant cashier in 1932, a vice president in 1937, and a senior vice president in 1953.

Stucker, commercial loan officer and secretary of the board of directors of NBT, first worked as a bookkeeper, stenographer and utility teller with First National Bank of Hoisington, Kans., before serving 3 years as assistant national bank examiner in the tenth federal reserve district and later in the audit and branch-examining divisions of Security First National Bank of Los Angeles. Stucker joined NBT in 1933 as an auditor and in 1937 assumed charge of operations and personnel; he later was promoted to comptroller, then cashier. In 1948 he became vice president and commercial loan officer.

Millard came to National Bank of Tulsa in 1927, beginning as a clerk and successfully serving as assistant cashier, assistant vice president and vice president before being elected to his new position.

Oilwell Appoints Field Representatives in La.

William H. Harris and Jimmy C. Mills were recently appointed field representatives at Lake Charles, La., and Harvey, La., for United States Steel Corp.'s Oil Well Supply Division, according to M. F. Jones, Gulf Coast area manager of the division.

Harris was employed in 1954 at Beaumont, Tex., where he was located prior to his present appointment. Mills joined Oilwell in June 1956 at Harvey.

Porter Will Build Office Building in Pittsburgh

H. K. Porter Co., Inc., has announced plans to build a 17-story office building in Pittsburgh, Pa., according to T. M. Evans, Porter's president. The general offices of the Porter company will occupy approximately six floors of the proposed building and the balance will be rented to other tenants. The proposed structure is expected to be ready for occupancy by mid-1958.

National Tank Appoints Lowd as Export Manager

J. D. LOWD

Judson D. Lowd has been appointed export manager for National Tank Co., Tulsa, according to Jay P. Walker, National president.

Lowd's background includes association with Parkersburg Rig & Reel as district engineer, assistant to general manager, and more recently manager of oil-field equipment sales.

Lowd will office with National Tank Co.'s export agent, The National Supply Co., export division, in New York City. He will work with National Supply's management in sales promotion and service of exported production and processing equipment.

Schlumberger Names District Managers

D. W. PATTERSON

W. J. MONKMAN

J. T. WILSON

Don W. Patterson is now manager of Schlumberger Well Surveying Corp.'s Swift Current, Canada, district office. Newly appointed manager of the Edmonton district is William J. Monkman. James T. Wilson has been named manager of Schlumberger's Oxbow district.

M. M. & M. Names Gilliland As Western Sales Engineer

The addition of Roger Gilliland as sales engineer for the West Coast with headquarters at the company's district office in Los Angeles has been announced by the industrial controls di-

vision of Manning, Maxwell & Moore, Inc.

Gilliland will be in charge of sales and service for American - Microsen electronic process control instruments on the West Coast.

Gilliland served as development engineer for Brush Development Corp. and was with Swartwout Co. for 10 years. Recently he was an application engineer for G. M. Giannini Co.

J & L Announces Sales Assignments

The appointment of George D. Watts to Jones & Laughlin Supply Division's Louisiana Gulf Coast sales district has been announced by W. L. Wolfe, vice president of sales. Charles P. Hudson, a J&L sales representative formerly located at Lake Charles, La., has been transferred to the firm's South Texas district with headquarters in Houston.

Bobbie W. Ramsey, formerly a storeman at Victoria, Tex., and James R. Kilmer, formerly manager of J&L's supply store at Clay City, Ill., have been promoted to sales representatives in the Louisiana Gulf Coast and the Illinois-Kentucky districts, respectively. Ramsey will concentrate his sales activities in the Lake Charles area, and Kilmer will operate out of the firm's Carmi, Ill., store point.

Watts will concentrate his sales activities in the Lafayette, La., area. He served as a storeman at Odessa, Tex., until his promotion to field sales representative in 1950. Since that time, he has served in Chicago, New Orleans, Shreveport, and more recently, Brookhaven, Miss.

Joining J&L in 1949, Hudson served as a storeman at Duncan, Okla., then was transferred to the Tulsa general office as a senior clerk in machinery sales. He later served as field salesman in Tulsa, Midland, and Lake Charles. Ramsey has served as a storeman at Victoria, Tex., since his employment in 1952. Kilmer joined the Carmi store as a storeman in 1945 and later was promoted to local store manager at Clay City, where he remained until his recent promotion.

Guests Attend Meeting of Houston Nomads

Guests attending a recent meeting of the Houston chapter of Nomads included R. L. Holden, retired, Houston; A. P. Berry, Socony Mobil Oil Co., Inc., Houston; O. H. Arnold, Socony Mobil, Caracas, Venezuela; George Colton, Socony Mobil, Caracas; Mario Cueto, Reed Roller Bit Co., Buenos Aires, Argentina; Bob Jarvis, SICA, Maracaibo, Venezuela.

OTIS PRESSURE CONTROL, INC.
Branches Throughout the Oil Country

reel off about

OTIS
PRESSURE CONTROL · SERVICE · EQUIPMENT

Otis..."First in Pressure Control"

Jones Joins Joe Stine As Chief Engineer

Kenneth E. Jones recently joined Joe Stine, Inc., as chief engineer. He will specialize in both the design and manufacturing supervision of offshore equipment for mobile barges.

Prior to his connection with Joe Stine, Inc., Jones had served with Reed Roller Bit Co. as design and field engineer. Before that he was with Lockheed Aircraft and Vega Aircraft. For 8 years Jones worked with Baash-Ross Tool Co. as field engineer and area engineer.

In connection with Joe Stine, Inc., Jones designed the jacking mechanism for the Mene Grande barge now operating in Lake Maracaibo, which uses the Joe Stine hydraulic jack.

Fullerton Plant Occupied By Ensign Carburetor Co.

According to Paul W. Ensign, president, Ensign Carburetor Co., has completed and is occupying its new factory of 110,000 sq. ft. built on a 10-acre site in Fullerton, Calif. From this location will be served complete carburetors and assemblies for the entire Ensign dealer and distributor organization as well as components to the Ensign factory branch in Chicago.

BrakeSol Promotes Barton, Appoints W. J. Boulden

W. R. BARTON

W. R. (Bill) Barton, former treating engineer for BrakeSol, Inc., at Casper, Wyo., has been promoted to sales promotion manager and will be working out of the home office in Oklahoma City.

Replacing Barton in Casper will be W. J. (Bill) Boulden, formerly a sales representative with Houston Oil Field Material Co. From Casper, Boulden will service all of Wyoming, Montana, North and South Dakota and eastern Canada.

These changes were announced by Lester P. Brake, president of BrakeSol.

Campbell Retires from Detroit Diesel Post

Arch F. Campbell, manager of engine sales to the petroleum industry for the Detroit Diesel Engine Division of General Motors Corp., has retired after 37 years in the petroleum industry. Campbell joined General Motors in 1944. With headquarters in Tulsa, he managed the sale of Detroit Diesel engines to the industry up to the time of his retirement. He also helped introduce these engines into oil fields in Canada and South America. Before joining General Motors he was with Waukesha Motor Co. and the Superior Engine Division of National Supply Co.

He was guest of honor at a reception and dinner on December 7 at the Hotel Tulsa in Tulsa. Robert F. Hunter, general sales manager of Detroit Diesel, Detroit, was master of ceremonies. A. W. McKinney, president of National Supply Co., Pittsburgh, told of Campbell's contributions to the industry.

Otis wire line and special services include Running and Pulling Otis Sub-Surface Controls Under Pressure • Running and Pulling Tubing and Drill Pipe Under Pressure • Perforating and Cutting Off Tubing Under Pressure • Internal Calipering of Tubing and Casing • Wire Line Fishing Jobs • Drilling and Repairing Gate Valves Under Pressure • Using the patented Otis Dry Ice Process for Emergency Repairs • Otis Permanent Completion Tools and Services • Running, Pulling, and Servicing Otis Gas Lift Equipment • Squeezing Thread Dope in Tubing Under Pressure

30 years' worth

OF EXPERIENCE

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Only one roller chain

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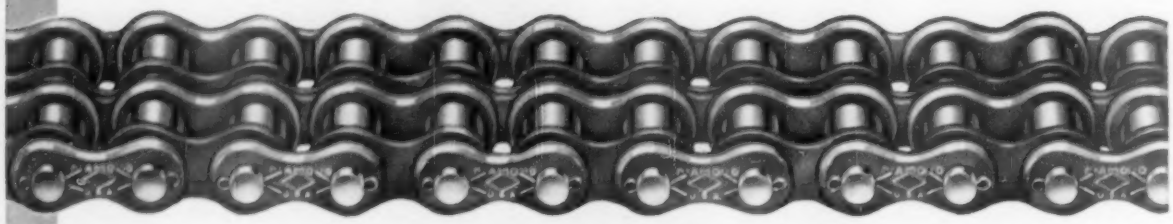
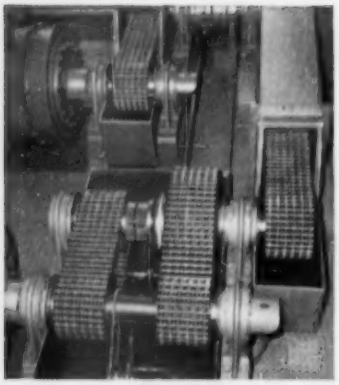


Throughout over 65 years of engineering and manufacturing experience, the Diamond Chain Company has expended all effort in the continuous improvement of one type of product—Roller Chain.

From the raw material specifications through every step of manufacture, heat treatment, shot-peening, preloading, and multiple inspection, a long tradition of highest uniform quality has been indelibly established.

Only this product bears the Diamond ◇ Trade Mark.



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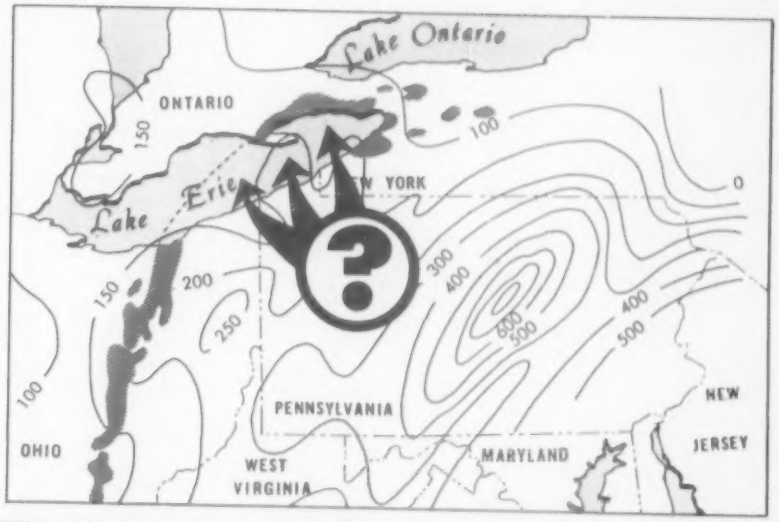
DIAMOND ROLLER CHAINS

Pennsylvania Will Go Offshore

by Frank J. Gardner



PENNSYLVANIA'S plans for offshore leasing in the waters of Lake Erie point to a new setting for underwater operations in oil and gas exploration. Shaded areas are Silurian producing trends; isopachs are on the basal Silurian sands. (Adapted from a map by Herbert P. Woodward).

IT was good news to hear the governor of Pennsylvania announce to the recent meeting of the Interstate Oil Compact Commission that his state is going offshore in its hunt for new oil and gas. We may expect similar announcements from New York, Ohio, and Michigan.

Gov. George M. Leader said that in 1957 the Pennsylvania Legislature will be asked to place responsibility for leasing the waters of Lake Erie with the Department of Forests and Waters. Following this, the state will probably have a lease sale and offshore drilling can get under way.

A regional trend . . . Offshore operations have been going on in Ontario for some time, in Lake St. Clair and western Lake Erie, with some success.[1] But such exploration has not yet been tried in the eastern half of the lake, where the prospects of success should be much brighter. Ohio's great Clinton-Silurian belt of fields, mostly gas but with some oil, stops short at the southern lakeshore. New York's Chautauqua County gas fields, south of Buffalo, abut the eastern shoreline, and Ontario's Silurian fields on the Niagara Peninsula border the northern shore. Geologists believe the trend extends across the lake in one great Silurian belt.

In 1954, Herbert P. Woodward, of Rutgers University,[2] had this to say: "It is not improper to remark . . . that for a distance of about 100 miles between Cleveland and Buffalo, the shallow waters of Lake Erie cover the extension of the Silurian productive belt. It is well within the limits of sound exploration to believe, if drilling could somehow be carried on 10 to 20 miles north of the south shore of the shallow lake, that additional Silurian pools could be found."

Needs drilling . . . This extensive Silurian trend, often called the "Clinton gas field" of East Central Ohio, extends from Lake Erie south to the Ohio River. Woodward pointed out that the chain of fields maintains a rather constant position 60 to 70 miles east and south of the crest of the Cincinnati arch. They are stratigraphic fields, detectable only by drilling on trend. Opinions vary about the actual cause of entrapment; some geologists believe the Clinton sands shale out updip toward the flank of the Cincinnati arch, while others contend that the sands were deposited in discontinuous lenses of sand as offshore bars in a receding sea.

But whether the traps result from facies change or lens deposition, the only way to find them is to drill. This has always been a fertile field for the old-time wildcatter. The sands are shallow (600 ft. in Ontario to 5,000 ft. in Ohio), potentials are good (up to 15 million cubic feet for gas wells), and the fields are exceptionally long lived. The gas brings a good price, too.

With new techniques . . . Drilling in the lake will be a different story from the land operations Ohioans and Pennsylvanians know. But they can learn from the Canadians. Consolidated West Petroleum, Ltd., has completed about 25 wells in water up to 65 ft. deep in its offshore program at the west end of Lake Erie. Half a dozen portable steel towers and platforms are employed in the search, and drilling is done with cable tools. The setup is actually not too different from that used in the Gulf of Mexico, once operations are under way. But well completions are definitely different.

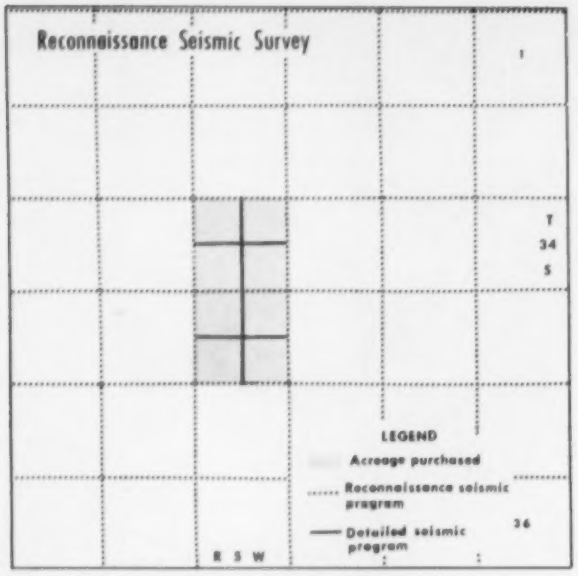
Consolidated has devised a method for underwater completion that is unique. Wellheads and valves are left under water, 30 to 60 ft. from the surface and just above bottom; wells are tied into the submerged pipeline by divers. This technique is a result of a sad experience in losing the first well in 1943 when floating ice destroyed the platform and ripped off the wellhead. It also assures no interference with shipping, although every well is marked by a floating buoy.

So we can look forward now to a new offshore reserve in the eastern half of Lake Erie. And the bidding should be brisk at that first Pennsylvania sale.

References

1. "Cable Tools Drill Offshore for Rich Canadian Gas Reserves," by P. S. Bazett, The Oil and Gas Journal, August 20, 1955, p. 166.

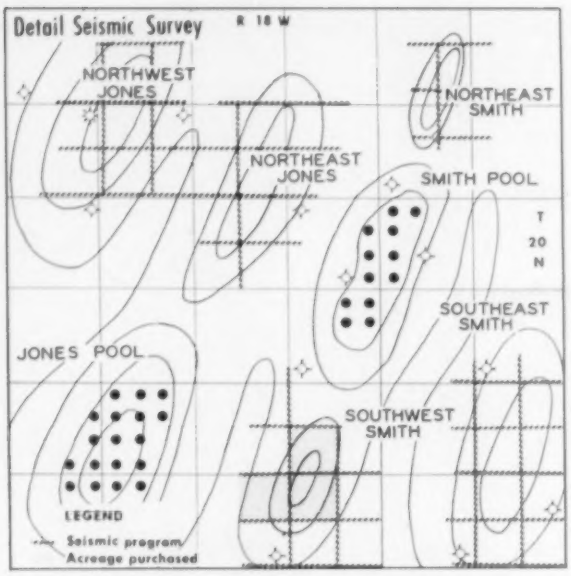
2. "Some Properties of the Deep Appalachian Basin," by Herbert P. Woodward, Paper 826-25-B, A.P.I. Division of Production, Spring meeting of the Eastern District, 1954.



PURPOSE OF SURVEY
To Evaluate the Oil Possibilities of Township 34s, Range 5w, Oshkosh County

Cost of seismic work at $1,000 per day	$70,000
Lease acquisition (1,280 acres at $25 per acre)	$32,000
Exploration costs charged off	
Exploration costs capitalized	$102,000
Geophysical costs capitalized	100%

All seismic and leasing costs are capitalized against the 1,280-acre prospect. This is the main disadvantage from a tax standpoint to reconnaissance seismic surveys.



PURPOSE OF SEISMIC SURVEYS
To Evaluate Five Subsurface Leads in Township 20n, Range 18w, Ranger County

Geophysical cost per prospect:	
Northwest Jones	$9,000
Northeast Jones	9,000
Northeast Smith	5,000
Southwest Smith	9,000
Southeast Smith	12,000
Total cost of seismic work	$44,000
Lease costs on Southwest Smith	$12,000
Geophysical work charged off	$35,000
Geophysical work capitalized	$9,000
Geophysical costs charged off	**79%**
Geophysical costs capitalized	**21%**

Only 21 per cent of the geophysical cost is capitalized against the Southwest Smith prospect. The shooting condemned the other four subsurface leads.

Here are valuable tips on . . .

How to Handle Geophysical Income-Tax Problems

by J. W. Yarbro

GEOLOGISTS and geophysicists play a key role in the determination of the tax treatment for geophysical expenditures. Therefore it is of utmost importance that they understand the problem. And they must take precaution to document sufficient information to establish the proper tax treatment for each geophysical project.

Listed below are suggestions to geologists and geophysicists on how to handle geophysical expenditures. If followed to a reasonable degree, these suggestions should minimize the number of tax disputes between the Government and the taxpayer over the treatment of geophysical expenditures:

1. State in advance the purpose and objectives of each geophysical program undertaken.

2. Delineate in advance the geographical limitation of each separate project which will constitute a single integrated operation and identify each project by name or number.

3. Keep a record of instructions given to the survey party.

4. Record the dates on which work is started and completed as to each project and as to each area of interest.

5. Identify each area of interest selected for more intensive study by assigning a code number which will relate to the project to which it belongs.

6. Upon completion of each program write a complete report giving the type, scope and results of the survey, conclusions reached and recommendations concerning further exploration, development or abandonment of the area.

One thing that a geologist or geophysicist should not do is concern himself with the matter of where the tax advantage may lie in any particular situation. The impartial testimony of the geologist or geophysicist will go a long way toward satisfying both sides in a tax dispute. After all he is the only witness qualified to give expert testimony on the matter.

At the risk of seeming naive, let it be said that most taxpayers and most revenue agents are concerned only with

The author is with Southern Production Co., Fort Worth. Paper presented at the twenty-sixth annual meeting of the S.E.G. at New Orleans.

what is right and proper under the existing tax laws and not with trying to put something over on the other.

While the suggestions given herein may impose additional burdens on the geophysicists and involve distasteful paper work, these efforts will be justified on the basis of tax dollars saved. And these savings might even offset some of the money spent on drilling dry holes which we frequently hear the geophysicists refer to as geological successes.

Accounting . . . Basically the tax treatment to be accorded geophysical expenditures is governed by accounting principle. It is merely a matter of accounting for dollars spent. Should these dollars be expensed or capitalized?

To expense them means to deduct them in full from earnings of the business as incurred. To capitalize them means to treat them as additional investments in the property to which they relate. A capital item may not be charged against income except through depreciation or depletion allowances, as a cost of sale if the property is sold, or as a loss of value if the property becomes worthless or is abandoned.

Depreciation is the allowance for gradual loss in value due to wear and tear, deterioration, or obsolescence. Depletion is the allowance for the exhaustion of a wasting asset such as oil and gas, or other minerals in place.

Geophysical expenditures that are capitalized are considered to be part of the cost of the oil or gas deposits which they seek to find. If oil or gas is eventually found, the geophysical costs along with other leasehold costs are charged off gradually in proportion to the oil or gas produced. This is called cost depletion. If no oil or gas is found, the capitalized geophysical costs are recoverable only when the property is sold, abandoned, or proved to be void of oil or gas deposits.

There is another type of depletion which has no relation to costs. This is known as statutory or percentage depletion and is based solely on oil or gas income from the property. It is computed by taking the lesser of 27.5 per cent of gross oil and gas sales or 50 per cent of the net profit.

A separate calculation is made for each separate producing property. Statutory depletion is not allowed in addition to cost depletion but in lieu thereof depending on which method results in the greater deduction. Usually statutory depletion exceeds cost depletion in which case no tax benefit is realized by virtue of capitalization of geophysical expenditures.

Historical practice . . . In the early days of the oil business long before the advent of income taxes, oil and gas operators searched for new sources of supply as an ordinary and necessary day-to-day feature of their business. This was natural and logical. Oil and gas producers must constantly seek and find new mineral deposits to replace those being depleted through production. This is a continuous never-ending process and most oil companies have adopted the practice of expensing all geological and geophysical exploration costs.

This practice was endorsed by certified public accountants and the Securities and Exchange Commission because it provided an accurate determination of net income for any given year.

The Bureau of Internal Revenue also agreed to this practice from the beginning of the income tax in 1913 until as recent as 1942. However, no provision was ever included in the Internal Revenue Code covering the treatment of geophysical expenditures in the search for oil; nor were any regulations ever written covering this subject. This is not unusual since there was no disagreement between the Government and taxpayers on this point. There remain today many situations not specifically covered by tax law which are accepted on the basis of accounting precept or cold logic.

Reconnaissance surveys . . .

"If no areas of interest are located or identified within an original project area, the entire cost of the reconnaissance survey may be charged off as a loss in the year of abandonment of that particular project."

New tax policy . . . In 1941 the Bureau of Internal Revenue issued a ruling pertaining directly to geological and geophysical exploration costs. The ruling, known as GCM 22689, did not question the right to expense such costs. However it held that they should be allocated to producing properties for the purpose of computing the 50 per cent of net income limitation upon depletion.

The oil industry interpreted this as an unwarranted encroachment upon the depletion allowance and raised a vigorous protest against the ruling. As a result the ruling was withdrawn by the bureau within 6 months after it was issued. But the victory for the industry, if it can be called a victory, was short lived.

Only 2 or 3 months later an order (FPM 241) was sent out from Washington to field agents instructing them thenceforth to capitalize all geological and geophysical expenditures which resulted in the acquisition or retention of property.

Since this was not a public ruling, it left the industry no basis for an official protest. It merely remained for individual taxpayers to take issue with the Bureau of Internal Revenue whenever this unpublished ruling was invoked. Not all taxpayers were willing to carry the issue to court. Some preferred to compromise this with other issues in order to reach an out-of-court settlement. One taxpayer, Schermerhorn Oil Corp., did take this issue before the courts and promptly lost (46 BTA 151).

Later came the Louisiana Land & Exploration Co. case (7 TC 507) which was also decided in favor of the Government. This case gave the Bureau of Internal Revenue the authority it needed and resulted in the issuance of a published ruling in 1950 setting forth official rules governing the treatment of geological and geophysical costs. It is known as IT 4006.

Ever since its release, this ruling has been assailed and criticized as being impractical and unworkable. However, it has not been seriously tested in court and remains today as the only recognized authority for treatment of geological and geophysical exploration expenditures.

IT 4006

The basic rule of IT 4006 is that all geological and geophysical exploration costs constitute capital expenditures and are not deductible as business expenses. It assumes that such costs are incurred for the purpose of obtaining and accumulating data which will serve as a basis for the acquisition or retention of property.

If the work is performed on property not then owned, such as under an option arrangement, and the property is acquired on the strength of the geophysical data obtained, the cost of the work is added to the cost of the property acquired. If none of the property covered by the survey is acquired, the costs may be charged off as a loss when the project is abandoned. If the work is performed on property already owned and the property is retained on the strength of the survey, the survey cost is added to the cost of the property.

If the results of the survey are not favorable but it is decided to hold the property for economic or strategical reasons, it is proper to charge off the survey costs as worthless. However,

Detail surveys . . .

"If no property is acquired or retained on the strength of the survey results, the total geophysical cost may be deducted as a loss when that area of interest is abandoned."

revenue agents have been instructed to allow such chargeoffs only in the face of convincing evidence that the geological and geophysical department recommended abandonment and the property was kept in spite of such recommendation.

Projects . . . For the purpose of applying the stated rule it is necessary to delineate the area being explored into projects and define the type of survey being conducted. A project, for the purpose of the ruling, is defined as that territory which can be explored advantageously as a single integrated operation, taking into consideration such factors as topography, size, existing information, and quantity of equipment, men, and money available.

Two types of surveys are recognized—reconnaissance and detail. Reconnaissance is described as relatively inexpensive work designed to locate those portions of the project area holding the greatest promise which are called areas of interest. Detail work is described as the more intensive operations seeking to obtain subsurface data sufficiently accurate to afford a basis for a decision to acquire the property, drill an exploratory well, or abandon as unworthy of further development.

Reconnaissance surveys . . . Costs of reconnaissance surveys in a given project are to be carried in suspense until completed and then allocated equally among the various areas of interest discovered. If, as is frequently the case, reconnaissance surveys are allowed to develop into detailed surveys as areas of interest are uncovered, it is permissible to consider the reconnaissance leading to the discovery of an anomaly and the followup detail survey as a complete and separate project.

If no areas of interest are located or identified within an original project area, the entire cost of the reconnaissance survey may be charged off as a loss in the year of abandonment of that particular project.

Detail surveys . . . The cost of the detail survey on an area of interest is added to the cost of the reconnaissance survey allocated to that area. If a lease within or adjacent to that area is acquired, or if a lease already owned is retained, on the strength of the survey results, the total geophysical cost is capitalized as additional cost of the lease.

If more than one lease is involved, the geophysical cost is prorated on an acreage basis. If no property is acquired or retained on the strength of the survey results, the total geophysical cost may be deducted as a loss when that area of interest is abandoned.

Drill-site surveys . . . A geophysical survey conducted for the purpose of locating a drill-site is permitted to be expensed as intangible drilling cost. The Internal Revenue Service limits the application of this rule to surveys covering property already owned which are followed quickly by the drilling of a well. A survey large enough to determine the size and shape of a complete structure and not merely the highest point on the structure or the exact point of overturning in a sharp fold will not be recognized as a drill-site survey even though it has that as one of its results.

Administrative problems . . . Without arguing the soundness of IT 4006, one of the principal criticisms leveled against it is that it is an oversimplification of a complicated problem. The Treasury's answer is: (1) Only broad rules can be stated in a published ruling relating to engineering problems; and (2) the gaps should be bridged by the exercise of sound judgment and compromise of conflicting views between the Government and the taxpayer.

The delineation of a project is troublesome. A project is limited in time as well as area. A material break in either time or area will cause a loss of correlation and therefore separate one project from another since a project is defined as a single integrated operation.

Taxwise it is desirable to restrict the size of each project as much as possible or divide a geophysical program into as many separate projects as is reasonable. To illustrate, assume that an overall program encompasses 50,000 acres and results in the leasing of only 5,000 acres. If the whole program constituted only one project, 100 per cent of the exploration costs would be capitalized to 10 per cent of the acreage explored. But if the program comprised 10 separate projects and the acreage acquired fell within or adjacent to only one project, only 10 per cent of the costs would be capitalized and the other 90 per cent charged off as a loss. It must be remembered that the Internal Revenue Service will not recognize projects which are obviously delineated merely for tax purposes. The delineation must be in conformity with operating conditions and physical features of the area.

Time element . . . A question frequently arises as to what period of time must elapse beween the completion of geophysical work and the point at which the project or area of interest may be considered abandoned. Does the fact that no lease is acquired within a period of say 6 months, a year, or even 2 years mean that it is proper to assume that no lease will be acquired?

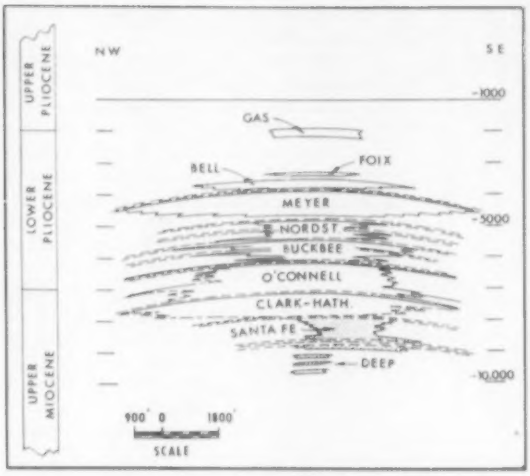
The answer to this question depends on the circumstances surrounding each individual case. In the case of so-called shooting options where the operator has the right to lease at a stated price any or all of the acreage explored, the expiration of the option period conclusively establishes the fact of abandonment of the project.

The anwser is more difficult in cases where exploration is performed on properties where the operator does not have a preferential right to purchase the acreage explored. This could be the situation where exploration is performed on offshore areas, state water bottoms, or other public lands subject to competitive bidding.

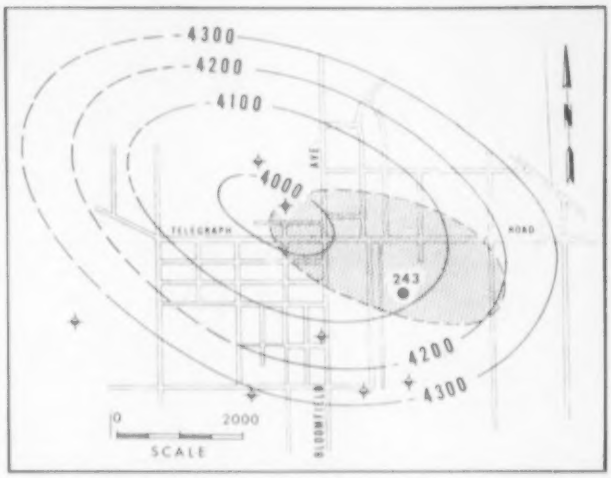
If in such a case the survey is followed by the submission of a bid or a request to have the acreage put up for auction, the survey cost should be suspended pending the results of the bidding and then capitalized if the bidding is successful or expensed if unsuccessful. If no positive action is taken toward acquisition of the property within a reasonable period of time following completion of the survey, it seems that the cost should be written off although there is no assurance that the writeoff would be allowed in the absence of a clear showing that the results of the survey were unfavorable.

Surveys on property already owned present probably the most frequent and most difficult problems. If all surveys were either good or bad, there would be no particular difficulty in applying the tax rules. Many surveys however seem to produce only mediocre or inconclusive results so that they can not be definitely classified as favorable or negative.

In such cases the decision to keep or drop the acreage is usually influenced by such things as the amount of rental necessary to keep the leases in force, activities of others in the general area, regional trends, farmout possibilities, and the relative importance of holding the acreage for protection.



DIAGRAMMATIC SECTION of Santa Fe Springs field. Fig. 1.



SANTA FE SPRINGS structure at top of Meyer zone. Fig. 2.

Old California field gets 29 new wells as . . .

Santa Fe Springs Adds 110-Acre Pool

by C. L. Doyle

THE Santa Fe pool of Santa Fe Springs field, California, was discovered early in 1956 and is now essentially completely developed with 29 producing wells and a proved area of some 110 acres.

Santa Fe Springs field is located 12 miles southeast of the center of Los Angeles. The field was discovered in 1919 and at one time had a maximum productive area of 1,500 acres. It has undergone two very intensive periods of development, first 1921 to 1923 and again 1928 to 1930.

Fig. 1 presents a diagrammatic section of Santa Fe Springs field. Prior to the discovery of the Santa Fe pool, there were seven recognized oil zones found at depths of 3,450 to 8,000 ft. There is also shallow gas zone at 2,000 ft. The upper six oil zones are in the Lower Pliocene (Repetto formation). The deepest zone, the Clark-Hathaway, is in Upper Miocene and was developed from 1928 to 1930.

In addition to the above zones, a section below 9,070 ft. that has been referred to as a "deep" zone was produced by one well, Union Oil Co.'s 100 Bell, between 1938 and 1941. This zone was abandoned as subcommercial in 1941.

The author is chief production engineer for General Petroleum Corp., Santa Fe Springs field, California. Paper presented at A.A.P.G. meeting in Los Angeles.

Pool development . . . The Santa Fe zone immediately underlies the Clark-Hathaway zone, and overlies the zone produced by Union's 100 Bell. Development of the pool began with the completion of General Petroleum Corp. Santa Fe 243 from intervals between 8,050 ft. and 9,010 ft. on February 2, 1956. The initial flow rate was 1,187 bbl. per day of 33.3°-gravity oil and 844 M.c.f. gas.

The completion interval of 243 included a portion of the uppermost sand produced by Union's 100 Bell. In the pool development, this practice has been followed in most of the wells.

Fig. 2 shows the Santa Fe Springs structure at the top of the Meyer zone. The hachures indicate the productive area of the Santa Fe pool. Santa Fe 243 is shown in the south central portion of the productive area.

Also shown are wells which penetrated the Santa Fe zone prior to its discovery. Union's 100 Bell is at the western edge of the proved area. The pool's small size and the fact it is offset to the east of the shallow zone crest undoubtedly delayed discovery.

Structure

Fig. 3 shows the Santa Fe Springs structure at the top of the lower Santa Fe zone. The contour interval is 50 ft. The contoured horizon is approximately the midpoint of the zone.

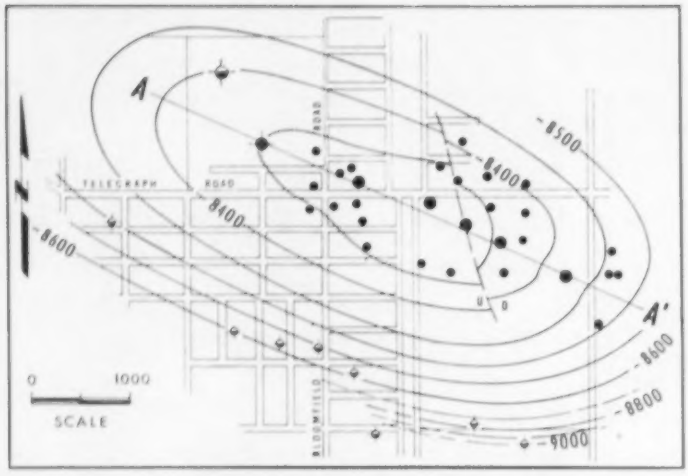
The structural high has shifted eastward some 1,500 ft. from that of the Meyer zone, primarily due to thinning of the Miocene section in this direction. Also, the elongation of the structure is more pronounced as a result of thickening of the beds north and south away from the axis.

The structural high is located just southeast of the intersection of the Santa Fe Railroad and Anaheim-Telegraph Road.

The dip of the flanks within the productive area is gentle, the order of 10°. However, wells drilled south of the productive area have consistently encountered dips of 50° to 80° within the zone.

The fault cutting the eastern portion of the structure is a reverse fault with downthrown side to the east and with a hade of 50° to 60° to the west. The fault is very apparent at Clark-Hathaway depth with 50 to 80 ft. of section repeated. Vertical displacement appears to decrease with depth and the fault is difficult to demonstrate within the Santa Fe zone. Displacement does not exceed 20 to 30 ft. at lower Santa Fe depth.

Wells designated by the larger circles are shown on sections AA', of Fig. 4. This section extends from the top of the Miocene through the Division B sands. Thinning of the Upper Miocene from west to east can be seen.



CONTOURS on top of lower Santa Fe zone. Fig. 3.

The structural high at the top of the Miocene is near the western edge. Proceeding downward the section shows the high to migrate eastward. At the top of the lower Santa Fe, it is located between General Petroleum Corp.'s Santa Fe 247 and 244.

In the Miocene Division B sands, it would appear the high is located even farther to the east.

Stratigraphy

The Upper Miocene column in Santa Fe Springs field is shown on Fig. 5. The electrical logs of General Petroleum's Santa Fe 243 and Union's 100 Bell are shown to illustrate the general stratigraphy.

The Upper Miocene in the field is in excess of 5,000 ft. in thickness and has not been completely penetrated.

Subdivision of the section is shown in the column to the left; Whisslers Division A is some 1,800 ft. in thickness, Division B 1,200 ft., Division C 1,200 ft. and Division D 800 ft. plus. From a zonal standpoint, the top of the Miocene occurs 50 to 100 ft. above the base of the O'Connell zone and the top of the Clark-Hathaway. Division A includes the Clark-Hathaway, and the Santa Fe zones. The deep zone is in Division B.

For comparison the completion intervals of Santa Fe 243 and Union's 100 Bell are shown by the heavy lines to the left of the respective logs.

Santa Fe zone section and type log . . . Fig. 6 represents the type of electrical log of the Santa Fe zone along with other characteristic data. The log and data are from Santa Fe 243.

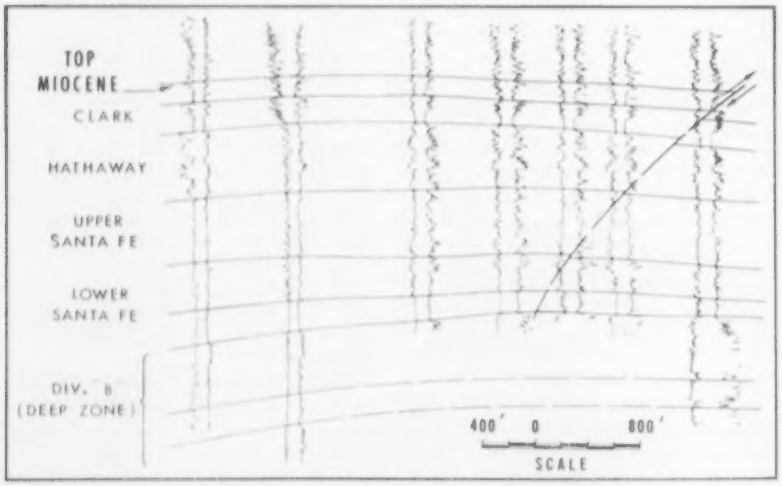
The upper Santa Fe zone is 450 to 500 ft. thick and contains some 150 to 200 ft. of sand. The lower Santa Fe zone is approximately 400 ft. thick and contains 100 to 150 ft. of sand. As noted previously, most wells penetrate 50 to 100 ft. into the Division B sands; permeable sand in this section ranges from 25 to 50 ft.

The Santa Fe zone has never been completely cored. The most representative sampling of the section was in 243 in which spot cores were taken at 100-ft. intervals. These cores are shown in the central section of the log; (Fig. 6) the core analysis of the sand in these cores is tabulated to the right. These are not presented as accurate average values of porosity and permeability for the zone since it represents only a fractional sampling in one well. However, the order of magnitude and trends are believed to be correct. All measured permeabilities have been low; a general lowering of porosity and permeability with depth can be seen.

. . . Intermediate waters. The full sand section is productive of oil and gas, only in a small portion of the productive area at top of the structure. In many wells, intermediate water is found. The most common wet zone is that shown on the log between 8,400 and 8,500 ft. Often there are additional wet sand stringers. The third sand member in the lower Santa Fe becomes wet a short distance from the crest of the structure.

. . . Gas sands. In a portion of the pool some sands carry gas. The sand just below 8,400 ft. is a gas sand at high structural position. From well performance in certain areas it appears there are other gas sands in the section, but these have not been located with reliability.

A number of completions were made from the full productive section before it was recognized there were gas sands present. Therefore a general practice has developed in the pool to produce these sands along with the oil-producing section. This has resulted in



CROSS-SECTION A-A' of Santa Fe Springs. Fig. 4.

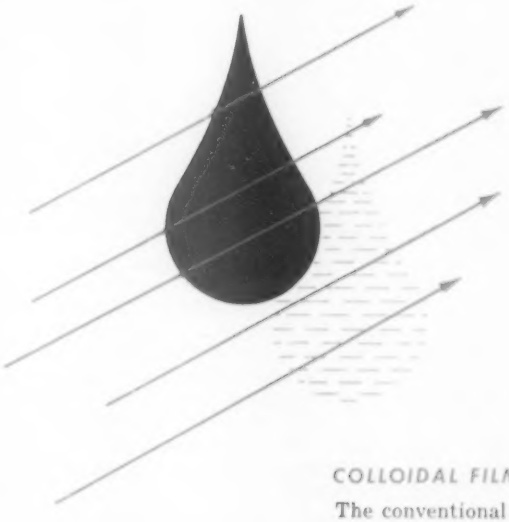
UPPER MIOCENE SECTION. Fig. 5.

EFFECTIVELY

REDUCE
Interstitial Water

INCREASE
Oil Production

with



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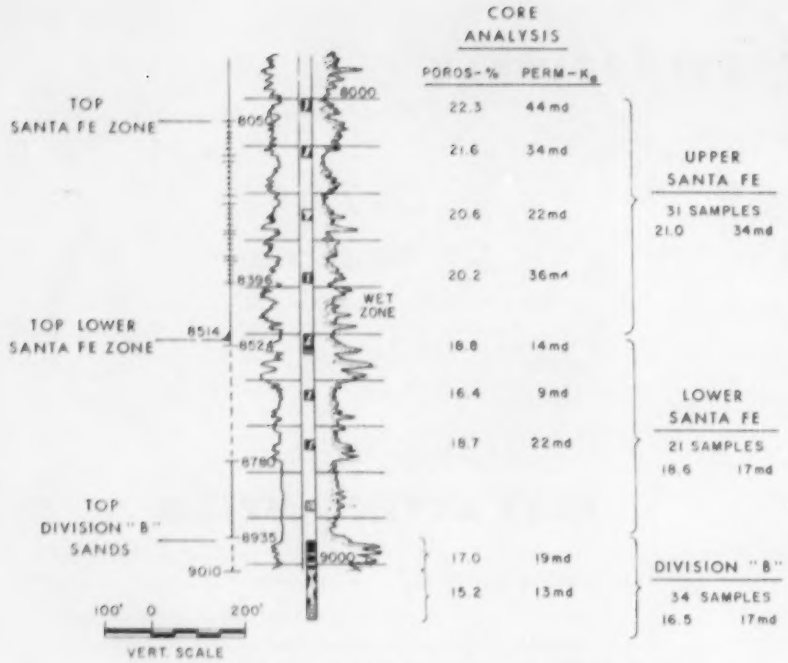
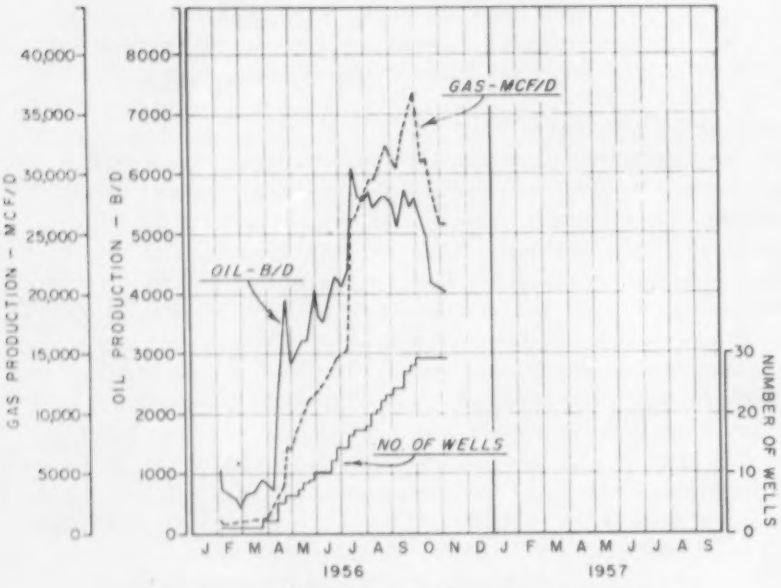


TYPICAL ELECTRICAL LOG for the Santa Fe zone. Fig. 6.



PRODUCTION HISTORY for the Santa Fe zone. Fig. 7.

high gas-oil ratios in wells with gas sands present.

Development

Fig. 3, which shows the structure at the top of the lower Santa Fe zone, also shows wells completed in the Santa Fe zone. Between February 2 and September 25, 29 wells were completed in the pool. The proved productive area is 110 acres and there is no drilling activity in or near the proved area at present.

The development pattern has been very irregular. Despite the small size of the pool, 10 operators have developed production. Spacing has been governed by the size of the operators property and has varied from one well per city lot to 5 to 10 acres.

In the development, 20 wells were completed from the full Santa Fe section plus a portion of the Division B sands, eight wells from the lower Santa Fe and Division B sand and one well from the upper Santa Fe only. These figures include two wells which have been completed with the full Division B sand section open in conjunction with a portion of the Santa Fe zone.

In both cases, the two zones have been produced together and no direct measure of the productivity of the Miocene Division B sands have been made. However, both wells are small producers indicating that this section yields very little fluid at these locations.

In general, wells completed from the full Santa Fe section have shown completion rates of 500 to 1,000 bbl. of oil per day. Wells completed from the lower Santa Fe and deep zones only have all been small producers, under 200 bbl. per day and as low as 50 bbl. per day.

The produced oil in the pool ranges in gravity from 32° to 37° A.P.I. The gas-oil ratio ranges from 3,000 to over 10,000 cu. ft. per barrel. As noted previously, the higher ratios appear to be due to the presence of gas sands.

Production History

Fig. 7 shows the production history of the pool. Oil production is shown by the solid line. Peak oil production of 6,000 bbl. per day was reached during July with 17 wells producing. Despite continued development with the wells producing at or near capacity, the oil rate has shown continuous decline.

In the first part of October, the operators placed in effect a curtailment program which is shown by the drop in pool production rate. The pool gas production is shown by the dotted line. Peak gas production of 37,000 M.c.f. per day was reached in late September.

The producing rate in early November 1956 was 4,000 bbl. per day of oil and 26,000 M.c.f.d. of gas. Cumulative production was slightly less than 1 million barrels of oil and 4,500 M.M.c.f. of gas with 17 wells flowing, 6 on gas lift, and 6 pumping. **End.**

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EXPLORATION

ARK-LA-TEX

NORTH LOUISIANA

Justina Area Discovery Flows Gas-Condensate

Michel T. Halbouty reported a flow of 164 bbl. of condensate and 1,700 M.c.f. of gas per day on 10/64-in. choke from lower Tuscaloosa perforations at 8,373-80 ft. at his 1 Fisher Lumber Co., C NE SE 24-12n-10e, 2¼ miles east of Lake Formosa field, a lower Tuscaloosa producing area of Tensas Parish. Halbouty's strike is located 2⅞ miles northeast of Justina in East Central Louisiana.

November Discovery

Only one new field was opened in North Louisiana during November. . . . Patton Church, Catahoula Parish.

The discovery well is H. L. Rowley, Inc. 1 Willie Lee Renfrow, NE NW 24-8n-6e, 2 miles north of Jonesville. The discovery flowed 108 bbl. of 47°-gravity oil per day plus 1/10 per cent basic sediment and water on ⅛-in. choke. Perforations are in the Wilcox at 4,469-70 ft. The west and southwest offsets to this new field were dry holes; a north try is now starting.

MID-CONTINENT

OKLAHOMA

Prue Discovery Finaled In Lincoln County

Lincoln County in Central Oklahoma has a new Prue-Pennsylvanian sand gas producing area. The discovery well is Nadel & Gussman 1 Von Deylen, NE NE SE 7-16n-6e, northwest of Pleasant Mound pool.

The well was fractured and perforated at 3,056-74 ft. It flowed 13 bbl. of oil and 24 bbl. water in 12 hours with 3,000 M.c.f. of gas per day on ½-in. choke. Open flow gas potential was 6,868 M.c.f. per day.

Hunton Discovery Seen Near Northeast Payne

Sunray Mid-Continent Oil Co. 1 Manning, SE NW SW 10-5n-3w, southeast of McClain County's Northeast Payne field in South Central Oklahoma, indicated oil from the Hunton at 8,282-8,316 ft. Recovery was 145 ft. of oil, 420 ft. heavily oil and gas-cut mud.

In 4-5n-3w, Sunray enlarged the producing area at 1 Little, C NW SW. A test of Bromide sand at 9,614-54 ft. flowed 60 bbl. per hour.

Bartlesville Oil Found At New Cleveland Pool

Recovery of Bartlesville sand oil was reported by Lone Star Producing Co. at their 1 Lindsay, C NE SE 16-10n-3w, outpost test to a new pool near West Moore in Cleveland County. Recovery was 20 ft. of free oil and 10 ft. of mud on test at 7,612-28 ft.

Unconformity zone pay was added to the new field by Stanolind Oil & Gas Co. at 1 Miller, C SW NE 21-10n-3w. Ohio Oil Co. is testing in the Red Fork sand at 1 Dieckman, C SW NE 17-10n-3w.

HUGOTON EMBAYMENT

NORTHWEST OKLAHOMA

Tri-Zone Discovery Reported at Laverne

A three-zone gas producer is indicated in the Laverne district, Harper County. Cities Service Oil Co. 1-C McClung, NW SW NE 10-26n-25w, tested 1,700 M.c.f. of gas per day from the Hoover sand at 4,117-87 ft.; 4,450 M.c.f. per day from the Tonkawa at 5,387-5,410 ft.; and 5,400 M.c.f. per day from the Chester-Mississippian at 6,889-6,983 ft. Operations began at 1-B McClung, NW NW SE 14-26n-25w.

APPALACHIAN

OHIO

An extension of ⅗ mile to Spring Mountain pool was completed natural as a 2,000,000 cu. ft. gasser by Killbuck Drilling Co. on 1 Everett Kasner, Section 7, Monroe Township, Coshocton County. Clinton sand was reported at 3,266-3,303 ft., with the gas in the lower part. The pool was just recently extended ½ mile to the west by the 1 Snow, and it now appears to cover a large area in the north-central part of the township.

● Hartley, Grumbell and Reed fractured their producer on 2 Henry Jackson, along the east edge of Flint Ridge field, Section 15, Hopewell Township, Muskingum County, and reported a gage of 250 bbl. in 24 hours. Clinton was found at 3,263-3,331 ft.

WEST VIRGINIA

In Allen district, Morgan County, West Virginia, Transcontinental Production Co. 1-K-1 Amasa Nestor, wildcat, elevation 627 ft., was dry, water 2,619 ft. and 3,196 ft., Oriskany sand 3,434 ft., hole full of water 3,705 ft. Total depth 3,875 ft.

● Dry Fork district, Randolph County, Hope Natural Gas Co. 10000 U.S.A. Dept. of the Interior, elevation 3,385 ft., topped the Oriskany sand at 5,834 ft. Chert was 5,627 ft.

PENNSYLVANIA

In Pine Township, Indiana County, Southwest Pennsylvania, Pittsburgh Plate Glass Co. 1 Jess Ober, wildcat, is shut down at 8,385 ft. The Onondaga was at 8,236 ft., and the chert at 8,253 ft., with gas first testing 15,000 cu. ft. Fracturing increased the gas to only 37,000 cu. ft.

● In Young Township, New York State Natural Gas Corp. N-522 had gas at 4,200 ft., testing 1,500,000 cu. ft. Drilling has been continued and is at 5,500 ft.

EASTERN KENTUCKY

In the Pike County sector of Big Sandy gas field, United Fuel Gas Co. have completed 8271 Matthew Hatfield on Sugar Camp Branch as a Mississippian Big Lime gas producer. Top of lime was had at 2,402 ft. with pay from 2,640 to 2,647 ft. At a total depth of 2,652 ft. and after acidization with 2,000 gal., well gaged initially at the rate of 5,663,000 cu. ft. of gas daily; 630 psi. rock pressure was had in 48 hours.

GREAT LAKES

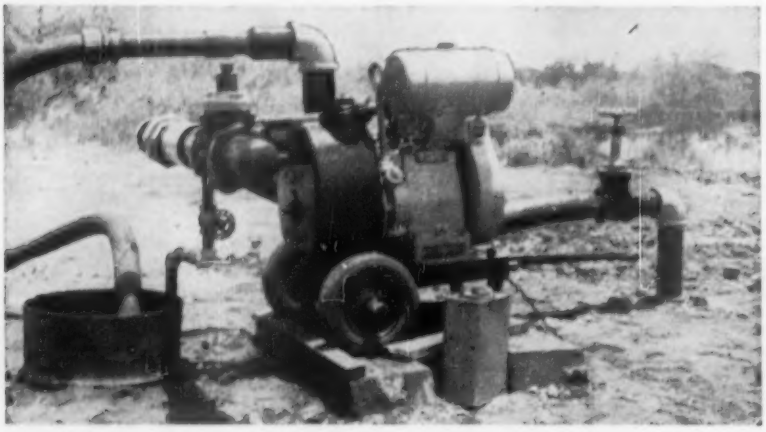
MICHIGAN

An interesting and important Gratiot County wildcat was under test in Alpena Traverse zone with free oil showing natural. New potential discovery well was Moco 1 Hoxie, SE SE NE 36-12n-4w, Seville Township, located about 2½ miles northeast of the Sumner Traverse pool and approximately 1 mile due west of the two-well Pine River Dundee oil pool.

The 1 Hoxie logged Alpena Traverse pay at 2,890-95 ft. Hole filled 1,700 ft. with free oil natural in 20 hours. Unconfirmed reports said that well made at least one natural flow this week. No water was reported to be in evidence. This pay, which compares

very favorably with typical Sumner field wells, which is being produced from about the same pay zone and level, will be tested further after clean-out following a 5-in. casing program with pipe set at 2,895 ft. on a packer at 2,876 ft. The Moco controls the bulk of the acreage surrounding this test well.

• An encouraging, but perhaps not commercial, oil show, accompanied with water, was logged in the Dundee-Reed City zone at a Colfax Township wildcat, Oceana County. Basin Oil Co. reported an oil-water pay logged 2,674-75 ft. at its 1 Hager, NW SE SE 31-16n-15w. Well carried 500 ft. of free oil on top of 700 ft. of water natural in 39 hours. Hole filled at the rate of 150 ft. of fluid an hour, 40 per cent oil, after casing had been set and first fluids removed from well bore. The 1 Hager was checked in structurally lower than any nearby correlating control point, but the presence of this showing at this particular spot in the Dundee-Reed City zone horizon is bound to stimulate additional drilling in the area even if current test is dry. Operators announced plans to deepen further in this objective before final completion.



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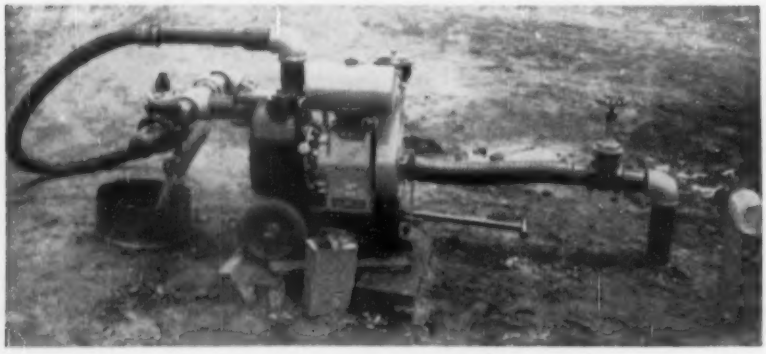
CONSTRUCTION MACHINERY COMPANY, Waterloo, Iowa

Pictured above & below, CMC Model 37-N on a typical oil field gathering operation.



WESTERN CANADA

ALBERTA

Five Discoveries Dot Canadian Map

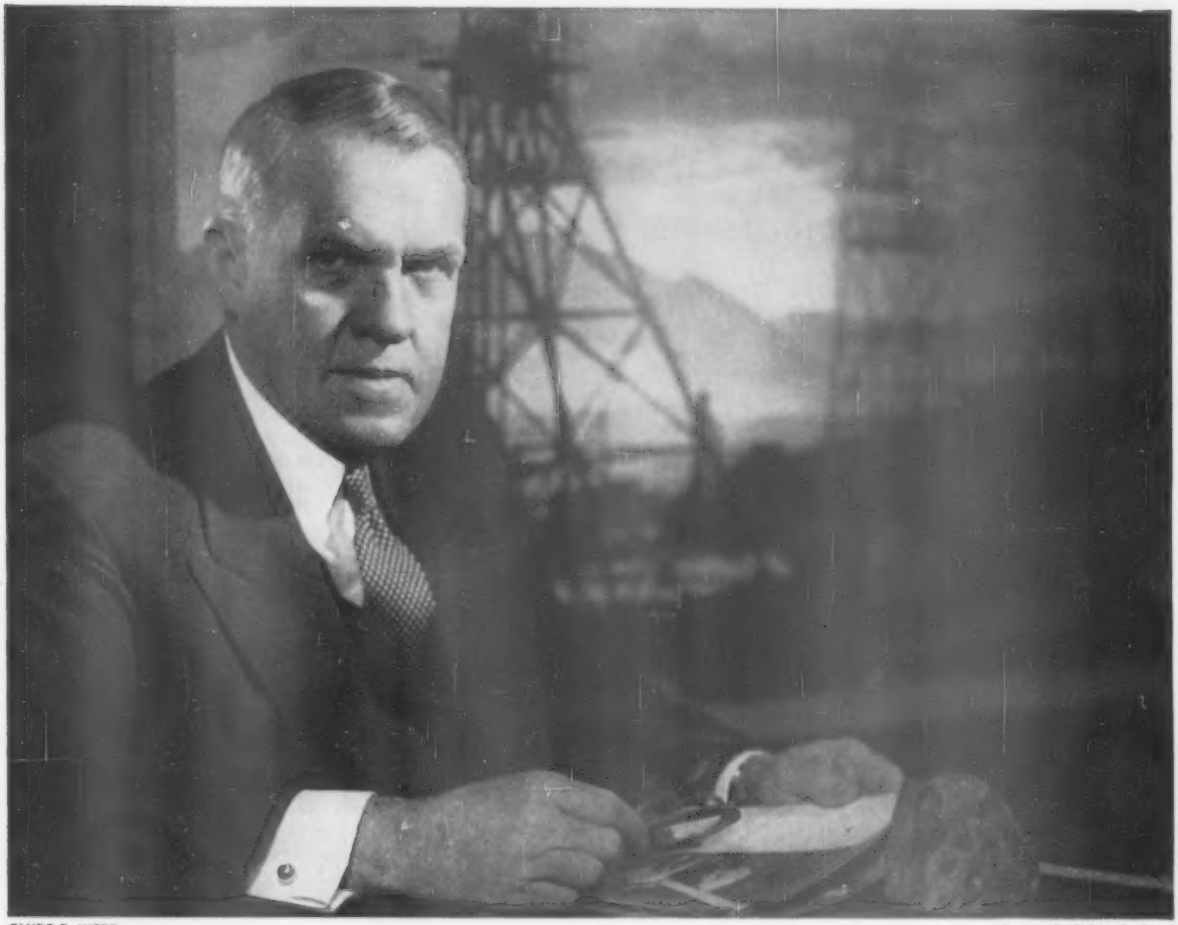
Western Canada's current exploratory drilling program, which stretches from the central portion of Manitoba to the northeast corner of British Columbia and from the International Boundary to the southern edge of the Northwest Territories, has indicated the presence of oil at another five wildcat tests during the past week. Two of those wells lie in the Normandville area of northwestern Alberta, one is in the central-west sector of that province, near Keystone townsite, 45 miles southwest of Edmonton, while the other two were drilled in the Browning and Viewfield areas of southeastern Saskatchewan.

The two Normandville wells are being drilled by the team of Colorado Oil & Gas Co. and Okalta Oils, Ltd., on farmout acreage it acquired from the Canada Oil Lands, Ltd., Calalta Petroleums, Ltd., and Plains Petroleum, Ltd., group. The well in the Keystone area was drilled on wholly owned acreage by Canada Cities Service Petroleum Corp. and Tidewater Oil Co. was responsible for the Browning area strike. The other indicated producer is being taken down by Canadian Oil Companies, Ltd., on farmout acreage from Canadian Superior Oil of California.

Discovery was indicated at the Colorado-Okalta & Associates 14-20 Normandville well, LSD 14, 20-79-22w5, when drill-stem test run in the Jurassic formation and covering a 20-ft. section in that horizon gave up 450 ft. of clean oil. Subsequent test, bottomed at 2,690 ft. recovered mud with a trace of oil and a large quantity of salt water. Drilling is being continued at the hole with the Permo-Pennsylvanian formation as its objective.

The other well in that area, Colorado-Okalta & Associates 4-15 Normandville, on LSD 4, 15-79-22w5, is being drilled as a D3 zone of Devonian test, but drill-stem evaluations in the upper part of that formtaion, the D1 zone, gave up encouraging showings of oil. Initial test in the zone covered a 60-ft. interval and gave up a total of 560 ft. of fluid, including: heavily oil-cut mud and mud-cut oil. The next test in the same horizon, and taking in an additional 30 ft. also give up water free oil-cut mud and clean oil. Drilling is also being continued at this hole.

The Cities Service strike, 16-20 Alsike, on LSD 16, 20-49-4w5, indicated the production of oil in the Cardium formation when recent production tests in that horizon flowed oil to the sur-



CLYDE E. WEED

Portrait by Fabian Bachrach

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CLYDE E. WEED, *President*
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face at the rate of 105 bbl. in a little over 10 hours. The crude is coming from a 30-ft. perforated interval below 4,050 ft. This well lies 6 miles north of other producers in the area completed by the firm and is the seventh test to indicate commercial production for the Cardium. Another well is currently being taken down for further evaluation of the area.

SASKATCHEWAN

The Viewfield, Saskatchewan test, White Rose-Canadian Superior 16-31 Viewfield, on LSD 16, 31-6-8w2, is situated 2 miles south of the Gridoil 16-7 Viewfield, Mission Canyon zone oil discovery well. During drill-stem test in the Charles sector of the Mississippian, taken of a 30-ft. interval, over 200 ft. of fluid entered the drillpipe consisting of mud, gassy, muddy oil and gassy oil. Testing operations are being continued at the well until that zone has been fully evaluated after which the crew will carry it down to the Mission Canyon sector.

The other Saskatchewan discovery the past week, Tidewater 14-11 Browning-Crown, on LSD 14, 11-6-5w2, indicated its production from the Mission Canyon zone. A series of drill-stem tests in that horizon either spray or flowed oil to the surface, but because of gas pressure at the hole, conclusive pipe recoveries were not made as most of the fluid was blown from the pipe upon completion of the evaluations.

PACIFIC COAST

CALIFORNIA

Richfield to Try Again at Fillmore

Richfield Oil Corp. has staked location for another shot at finding deep production in Fillmore field, Ventura County. Richfield's latest test, 1 McNab estate, will be drilled about ¾ of a mile east of the nearest Fillmore producing well in SE NW 25-4n-20w. A little more than a year ago Richfield drilled and abandoned a 16,015-ft. wildcat about 1½ miles southeast of this new try.

At the present time Standard Oil Co. of California and Humble Oil & Refining Co. are the only companies with producing wells in the deep Pliocene field. Standard was making water shut-off tests on a 14,000 ft. extension test in the center of 26-4n-20w, while Humble was drilling ahead below 12,000 ft. on two other wells a few hundred feet north and south respectively of Standard's well in other current activity there.

Celebrities Join Oil Play in Kern County

Kern County has taken on the aspect of being an autograph hound's haven as well as a rock hound's happy hunting ground with at least two celebrities of the entertainment and sports world involved in drilling activities there. Famed radio and TV personality Art Linkletter recently completed two wells in the county, one in Lost Hills field and the other at Mount Poso field. The nation's top money-winning Jockey, Eddie Arcaro, recently revealed plans to drill a wildcat in Mountain View field region in a joint venture with Contract Electronics Corp., Inc., of Culver City, Calif.

Monterey Seaching for Island Site at Huntington Beach

Monterey Oil Co., as operator for itself, The Texas Co., and Seaboard Oil Co., was drilling below 6,718 ft. on the first of a series of stratigraphic tests it will drill on State Lease 1550 a mile offshore from Huntington Beach.

Monterey is using the Pacific Coast's first gulf-type drilling platform to block out this 2-sq.-miie lease in a search for the best place to build an artificial drilling island.

ROCKY MOUNTAIN

WYOMING

Discovery Indicated at Rank Converse Well

A remote wildcat, 13 miles west of Lance Creek and Lightning Creek fields in Converse County, Powder River basin, recovered 2,520 ft. of clean oil on a drill-stem test at 6,415-6,660 ft. in the Parkman. The indicated discovery is Anschutz Drilling Co. 1 Government, C NE SW 24-35n-68w.

Old Woman Activity Data Is Released

Coronado Petroleum has released information in a seven-well drilling program in Niobrara County's Old Woman anticline area.

There have been seven wells completed at Old Woman, two of them apparent successes, two still in testing stages.

The 3 Government-Hendrickson, SE NE NE 8-36n-62w, one of the indicated oil strikes, and the 4 Government-Hendrickson, NE SE NE 8-36n-62w, are Leo sand-Minnelusa producers. Tests at these two wells ranged from 10 bbl. of oil per day to 30 bbl. hourly.

UTAH

Confirmation Well in Paradox Testing

Western Natural Gas Co. recovered oil on tests of 6 English, SE SE NE 16-43s-22e, San Juan County. This well is the confirmation to the 7 English Tribal, NE NW 16-43s-22e, a Paradox well at 4,361 and 4,699 ft. It finaled pumping 16 bbl. of oil and 36 bbl. of water per day. The new well flowed oil at the estimated rate of 20-30 bbl. hourly with 3,690 M.c.f. of gas on drill-stem tests. Location of these two wells is 1½ miles northwest of Boundary Butte field, a Hermosa gas producer at 5,200 ft.; and, an oil producer in Coconino above 2,000 ft.

EASTERN INTERIOR

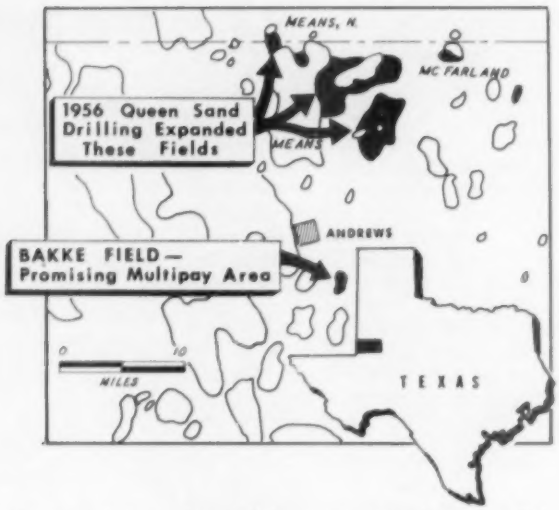
WESTERN KENTUCKY

In Hopkins County Felmont Oil Co. and Lohmann-Johnson Drilling Co. 1 Burnett Word, 2 miles south of Hanson in 7-K-25, recovered 1,400 ft. of clean oil on a drill-stem test at 2,944-60 ft. in the Aux Vases lime. Operators have set casing to test at 2,948-55 ft. Location is 6 miles from production.

"Glad you live close by—drop over often."

The Queen of Means Adds Much Oil To West Texas County

by Carl Hoot



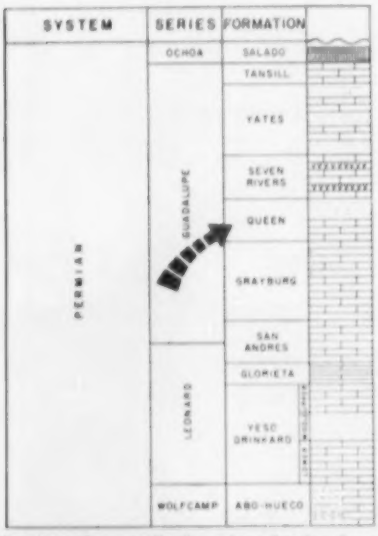
Andrews County, West Texas. Black areas show 1956 expansion.

QUEEN sand drilling has added several thousand barrels daily to the production capacity of Means and McFarland fields in northern Andrews County.

The Queen is a sand of upper Permian age, and lies just above the Grayburg. It was first productive in Means field in 1954.

How It Started

Humble Oil & Refining Co. reworked an old dry hole in the northern portion of Means field, and came up with a 380-bbl. well from the Queen. About the same time, Vests, Dorbandt & Ross completed a 360-bbl. well to the east of Humble's test. These two were the first Queen wells in the fields directly to the east of Hobbs, N. M. The two discoveries were in the latter part of 1954. During 1955 Queen drilling was mostly confined to workover wells at Means field.



Portion of generalized section showing location of the Queen. From Petroleum Review, Lea County, New Mexico, Phifer Petroleum Publications.

Expansion in 1956

This year has been a different story. In the northern portion of Means, Queen sand pay was found from 3,965 to 4,200 ft., and potentials ranged from 200-700 bbl., with an average around 225 bbl. An indication of the growth in these areas are the daily production capacities. Production assigned to Means-Queen had a daily producing capacity of slightly over 8,000 bbl. in December 1955.

The Texas Railroad Commission's latest production report shows this same area as being able to produce over 12,000 bbl. daily. This is not the amount produced nor the allowable, but would come close to the fields' MER.

Drilling this year has filled in the gap between Means, North (in Gaines County) and Means in Andrews County. Queen producing capacity in Means North was zero last year, and over 3,000 bbl. daily at this time. Wells in this area top the sand pay around 4,250 ft.

Queen production assigned to McFarland fields had a capacity of 3,900 bbl. daily a year ago, compared with 15,000 bbl. daily on the Railroad Commission's latest report. Wells in McFarland areas have found the sand from 4,550-4,800 ft., with completion potentials in the 200 bbl. per day class.

McFarland field, northeast of the original Means field, also is being explored for deeper pays. Last week a dual well, Magnolia Petroleum Co. 13-2-UT Minton in 7-A19-PSL, completed as the second Strawn and third Wolfcamp producer for that area.

Magnolia's well flowed 300 bbl. a day from the Strawn at 10,423-54 ft., choke size not reported, and 201 bbl. daily from Wolfcamp perforations at 9,070-89 ft.

Humble opened Strawn pay in McFarland field in August this year at its 29 J. S. Means, flowing 230 bbl. a day from 10,711-31 ft.

Bakke Field in Andrews Gets Two New Pay Zones

Pennsylvanian and Wolfcamp pays were opened in the Bakke (Devonian and Ellenburger) field, southeast of Andrews.

W. E. Bakke, San Antonio, 3 Grady, in 22-A44-PSL, opened both zones. Pennsylvanian potential was 275 bbl. of oil a day through ¼-in. choke, from perforations at 8,956-86 and 9,004-14 ft. Wolfcamp potential was 204 bbl. a day through 1-in. choke and perforations at 8,514-60 ft.

The field discovery made 1,022 bbl. a day from the Ellenburger at 12,312-53 ft., and 1,308 bbl. a day from Devonian perforations at 10,536-54 ft. This well also indicated production in the Wolfcamp, Pennsylvanian and several Permian sections. The Bakke structure is thought to be separate from Wemac, 2 miles to the east.

Heavy Devonian Flow

Honolulu Oil Corp. 5 Parker "D," west offset to Bakke & Choya's discovery of Bakke field, has flowed oil at the rate of 100 bbl. an hour on drillstem test of the Devonian.

The heavy flow came on a test at 10,509-40 ft. Using 1,000 ft. of water blanket, oil surfaced in 29 minutes. It was cleaned into pits for 3 minutes, then turned into tanks where it gaged 166 bbl. of oil in 1 hour and 40 minutes. Choke on the test was not reported. Bottom-hole flowing pressure ranged from 2,920-4,165 psi.

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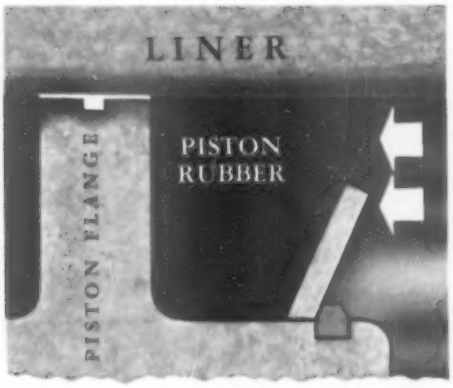
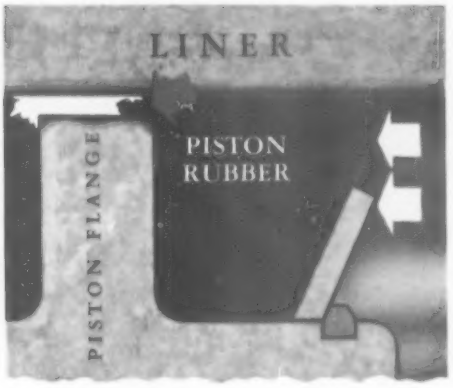


When liner and piston flange fit closely, pressure can not extrude rubber into the clearance to be pinched off. A close fit between piston and liner eliminates the main cause of piston failure and greatly extends piston life.



An important cause of piston failure is excessive clearance between the piston flange and liner. When pump is operating, pressure forces a part of the piston rubber between the space where it is pinched off. This action seriously shortens piston rubber life.

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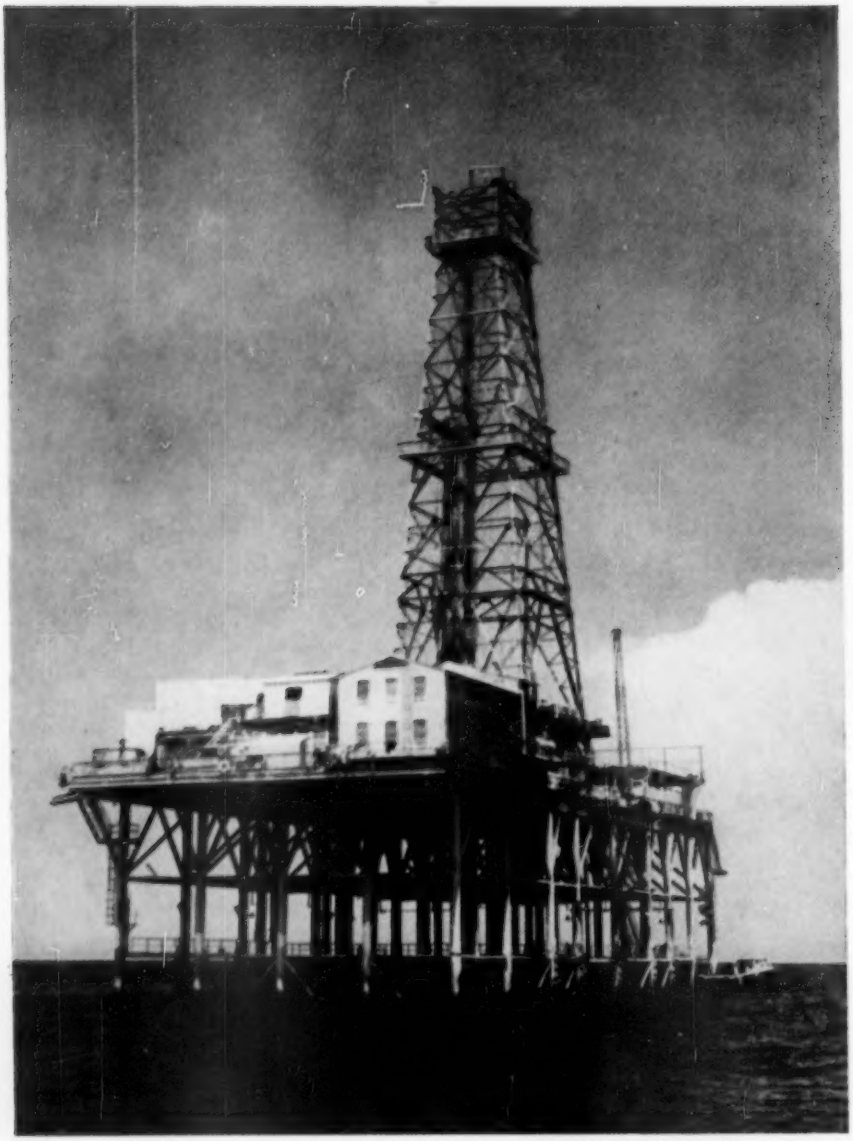
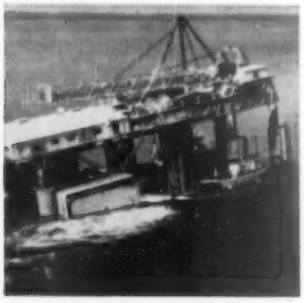
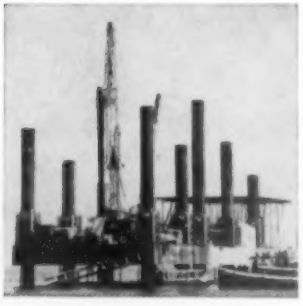


OFFSHORE SOUTH LOUISIANA—Six wells are directionally drilled from this structure specially designed by Lee C. Moore Corporation.

General view of offshore drilling platform. Visible are drilling derrick, crew housing facilities, mud tanks and other equipment.



An offshore drilling giant moves out to sea. It is designed to operate in 100 foot water if necessary.



Variation of drilling platform with Moore Cantilever Mast.

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SOUTH LOUISIANA

LOUISIANA GULF COAST

Lake Washington Well Tests Deep Production

John W. Mecom and Freeport Sulphur Co. appear to have another important deep-sand discovery in the Lake Washington area, in the coastal marshes of Plaquemines Parish.

Their 46 Earnest Cockrell, Jr., off the north flank of the dome, flowed at the rate of 6,000,000 cu. ft. of gas per day, recovering 80 bbl. of 44.7°-gravity condensate per 1,000,000 cu. ft., in a drill-stem test of sand topped at 15,390 ft. Flow was through ¼-in. choke.

Bottom of the hole at 15,472 ft. was still in the sand above the water level.

The well confirms and extends 15,000-ft. production opened in the north flank area by the same company in their 1 L. L. & E., completed nearly 2 years ago with pay at 15,090-15,140 ft. The latter well is 2 miles east of the 46 Cockrell which is the third attempt to confirm the deep production.

TEXAS GULF COAST

Wrong Well Reported as Texas Offshore Discovery

A mixup in well locations led to an erroneous report in The Oil and Gas Journal's December 10, 1956, issue (page 193) that Arkansas Fuel Oil Corp. had completed its deep wildcat in State Tract 905, in the Gulf of Mexico, off the coast of Nueces County, as a gas-condensate producer, opening the Texas coast's seventh offshore field.

The completed well was in State Tract 9, at the northern end of Corpus Christi Bay. It is in the Northwest Corpus Christi Channel area, about 3 miles southeast of Portland.

The test in the Gulf of Mexico at last report still was drilling with bottom near its 12,000-ft. objective. The bay well had an open-flow potential of 15,600,000 cu. ft. of gas and 17 bbl. of 63.5°-gravity condensate per day from perforations at 7,659-74 ft.

Successful Wildcats

TEXAS GULF COAST

Brazoria County: Pano Tech Exploration Corp. 2 Zeno Ross, Lot 5, Blk 2, J. Thompson Sur., A-134. IP 10,000 M.c.f. daily, open-flow potential, GOR 17.3 M.c.f. per barrel, 56.5°, perfs. 10,056½-58 ft. (New pay in Lockwood field.)

Bradco Oil & Gas Co. 1 Rowan Gas Unit (2 Manuel Rudy 1), Angier Hall Bradley Sur., A-6. IP 19,500 M.c.f. daily, open-flow potential, GOR 90.9 M.c.f. per barrel, 43.8°, perfs. 10,520-43 ft., and (dual completion) 70,000 M.c.f. daily, open-flow potential, GOR 31.25 M.c.f. per barrel, 50.6°, perfs. 10,180-90 ft. TD 10,790 ft. (New pays in Rowan South field.)

Chambers County: Group Oil Co. 1 Anahuac Townsite, Lot 7, Blk. 3, Townsite, George E. Willcox Sur., A-316. Shut-in gas well, no gage perfs. 8,605-15 ft. TD 8,750 ft. (New field.)

Colorado County: Shell Oil Co. 1 Saunderman, Columbus Tap Sur., A-154. (4 miles SE of Eagle Lake). IP 6,500 M.c.f. daily, open-flow potential, GOR 48.1 M.c.f. per barrel, 49.9°, perfs. 9,714-36 ft. TD 9,805 ft. (New field—Eagle Lake.)

DeWitt County: Midstates Oil Corp. 1 Rangnow, James S. Turner Sur., A-460. IP 3,500 M.c.f. daily, ⅛-in., perfs. 2,734-36 ft. TD 8,310 ft. (New pay in Meyersville field.)

Jackson County: Crown Central Petroleum Corp. and Aluminum Corp. of America 1 Bolling et al Unit, Samuel C. Lyons Sur., A-212. IP 26,000 M.c.f. daily, open-flow potential, GOR 24.4 M.c.f. per barrel, 48.2°, perfs. 8,520-20½ ft. TD 9,000 ft. (New pay in Appling field.)

NORTH TEXAS

Baylor County: Tennessee Gas Transmission Co. 1 Russell, Sec. 94, T&NO Sur., 4 miles SW Seymour. IPP 14 BOPD, 39°, GOR 300, Tannehill sand 1,311½-17½ ft. TD 1,453 ft.

Foard County: The Texas Co. 20 Johnson, C. Choate Sur., 15 miles SW Cromwell. Old well recompleted. Old TD 4,784 ft., PB 4,774 ft., perf. 4,754-64 ft., IPP 36 BOPD, 43°.

Knox County: Christie-Stewart Drilling Co. 1 Farrington, D. G. Burnett Sur. 9, A-23, 2 miles NE Knox City. IPP 100 BOPD, 35°, GOR 120, Tannehill sand 2,087-93 ft. TD 2,223 ft.

Glenn W. Cooper 2-A Golden & Golden, 61-45-H&TC, 2 miles E Goree. IPP 105.7 BOPD, 36°, GOR 200, Tannehill sand 1,683-94 ft. TD 1,727 ft.

Noel Pautsky 1-C E. W. Hunt estate, Blk. 17, J. Garner Sur., 2 miles W Red Springs. IP 38.8 BOPD, ½-in., TP 50 psi., 35°, GOR 250, Tannehill sand 1,549 ft., TD 1,553 ft.

Wichita County: Knight & Grinnan 1 Harrell, Blk. 16, Lge. 2, Denton CSL, 7 miles SW Wichita Falls. IPP 77 BOPD, 41°, GOR 320, Vogtsberger sand 4,844-54 ft. TD 4,880 ft.

WEST TEXAS

Ector County: British American Oil Producing Co. 1 Pool, 25-42-T2S-T&P, 1 mile SE Odessa. IP 146 BOPD, 20/64-in., TP 200 psi., GOR 884, 37°, Wolfcamp perfs 9,870-84 ft. TD 12,300 ft., PB 9,950 ft. Elev. 2,919 ft.

Scurry County: W. M. and A. P. Fuller 1 Fuller, 87-5-H&GN, 7 miles NE Dermott. IPP 19 BOPD, 37°, GOR zero, San Andres 2,066-84 ft. TD 2,745 ft.

Tom Green County: Slick Oil Co. 1 Kent, Sec. 197, SPRR Sur., Dist. 11, 6 miles SW Vancourt. IP calculated open flow 9,000 M.c.f. gas, Strawn lime perfs. 4,632-42 ft. No pressures reported. TD 5,335 ft.

SOUTHEAST NEW MEXICO

Lea County: Cities Service Producing Co. 1 State "AX" Unit, 14-18s-35e. IP 1,022 BOPD, plus 439 bbl. salt water, ½-in., TP 560 psi., GOR 1651, 41.6°, Pennsylvanian perfs. 10,945-65 ft., TD 12,341 ft., PB 10,978 ft., elev. 3,893 ft. Completed natural.

Sinclair Oil & Gas Co. 1 Danglade, 15-16s-35e, IP 484 BOPD, 14/64-in., TP 400 psi., GOR 104, 60.4°, top Devonian 12,424 ft., perf. 12,638-68 ft., TD 12,978 ft. Elev. 3,998 ft.

SOUTHWEST TEXAS

McMullen County: The Texas Co. 6 Gouger, South Campana Sur. 103, A-2137. IPP 46 BOPD, 21.8°, perfs. 3,024-29 ft. TD 3,030 ft. (New pay in South Campana field.)

ALBERTA

Richfield 11-16 Goose Creek, LSD 11, 16-42-12w4. TD 3,146 ft. Cretaceous gas well.

COLORADO

Routt County: Union Oil Co. of California 1 Watson Sec., NE SW NE 30-4n-89w. IP 2,200 M.c.f. of gas per day, Dakota discovery, new field. TD 5,160 ft. Weber.

CALIFORNIA

Los Angeles County: Edward Nepple 1 SP-Pedro-Nepple, NW NW 6-3s-11w, 720 BOPD, 34° gravity, 10 per cent mud, 20/64-in. choke, perfs. 9,443-9,503 ft., 9,580-9,610 ft., 9,645-75 ft., and 9,695-9,725 ft. TD 10,152 ft. (New pool discovery on west edge of Santa Fe Springs field east of metropolitan Los Angeles.)

OHIO

Coshocton County: Ohio Fuel Gas Co. 1 L. M. Boal, Lot 22, Washington Township. IP 4,375,000 cu. ft. Clinton 3,422-67 ft. TD 3,484 ft.

WYOMING

Weston County: William F. Sheehan, Jr. 1 State, SE SE SE 3-44n-61w. IPP 13 BOPD, 22 BWPD, Newcastle discovery, new field. TD 1,300 ft. Newcastle.

NORTH LOUISIANA

Bossier Parish: Midwest Oil Corp. 1 Bruce Cartwright, C SW SW 34-23n-13w. IPP 74 BOPD, Pettet 6,349-57 ft., 38.8°. TD 7,412 ft. (Discovery of Bolinger field.)

Franklin Parish: Jones-O'Brien, Inc., and Custer Primos 1 Margarette Franks, 3 miles southwest of Baskinton field in C NW SE 36-16n-7e. 1¾ miles northwest of Baskinton. IPF 192 BOPD, ¼-in. choke, Tuscaloosa 3,622-26 ft. TD 4,221 ft. (Discovery in Mangam area).

LaSalle Parish: Nebo Oil Co., Inc., 52 Nebo fee, ¾ mile southeast of production in 33-9n-2e. IPP 12 BOPD, Wilcox perfs. 1,816-19 ft. TD 3,946 ft. Little Creek discovery.

LOUISIANA GULF COAST

Cameron Parish: Pure Oil Co. 1-A State Lease 2760, Blk. 2, West Cameron area, Gulf of Mexico. IP 136 BOPD, ⅛-in., GOR 406 cu. ft. per barrel, perfs. 4,674-81 ft., and (dual completion) 117 BOPD, ⅛-in., 29.5°, GOR 498 cu. ft. per barrel, perfs. 5,192-95 ft. TD 12,257 ft. (New pays in Creole—West Cameron Blk. 2 field.)

Evangeline Parish: Placid Oil Co. 1 Hillyer-Duetsch-Edwards, 23-5s-2w. Shut-in gas well, no gage, perfs. 7,891-94 ft. (Frio). TD 10,453 ft. (New field.)

Iberia Parish: C. G. Glasscock and Tidelands Oil Co. 1 Cooke-Goodrich, 15-12s-11e. Shut-in gas well, no gage, perfs. 11,567-11,607 ft. TD 12,500 ft. (New field.)

Jefferson Parish: C.A.T.C. Group (Continental Oil Co.) 1-B OCS 0128 (State Lease 948), Blk. 40, Grand Isle area, Gulf of Mexico. IP 256 BOPD, ⅛-in., 32.6°, GOR 545 cu. ft. per barrel, and (dual completion) 299 BOPD, 5/32-in., 33°, perfs. 9,956-78 ft. TD 15,248 ft. (North extension and new pays in Grand Isle Blk. 47 field.)

Back of Petrofina mushroom . . .

. . . An Oil Man in a Big Hurry

SPEARHEAD of American Petrofina, Inc.'s campaign to carve out a big place in the American oil industry is Harry A. Jackson, Jr. He's a veteran oil man who combines enthusiasm and optimism with the know-how acquired by 35 years in the industry.

Jackson became president of American Petrofina earlier this year after 35 years with Tidewater Oil Co. and predecessors. When he became president, all he had to preside over was a small New York office. But he had the financial backing of the giant Belgian Petrofina and instructions to put together an oil empire in the United States.

Last week Jackson was busily engaged in the final stages of negotiating for American Petrofina's second acquisition within a year. The latest deal involves American Liberty Oil Co. of Dallas.

It is a small integrated firm operating a refinery in Northeast Texas, holding producing properties in Louisiana and Texas, and marketing in a small area adjacent to its refinery.

Earlier Jackson had handled acquisition of Panhandle Oil Corp., which had a refinery and crude production in Texas and marketing outlets in North Texas and southern Oklahoma.

Not the end . . . Jackson says American Petrofina is still in the market for other properties. They must fit in with his plans for a fully integrated, economic operation.

Primary emphasis in the early stage of Jackson's campaign is on producing properties. The reason is simple. He feels this is a surer way of building up a crude supply than going out and hunting for oil.

At this stage, American Petrofina within a year has risen from scratch to a firm with physical assets of $90 million and employes totaling about 900.

Growing fast . . . Back of this mushroom growth is a dynamic man who is an oil operator first and last.

Jackson's father was connected with Tidewater for many years. Jackson first worked for the company during summer vacations both while in high school and college.

After graduating from the University of California, Jackson joined Tidewater as a plant clerk in the marketing department at Oakland. In relatively rapid succession he became district manager for central California, went to Los Angeles in 1929 to head southwestern California operations, and a year later took over the northwest area including British Columbia.

HARRY A. JACKSON, JR.
. . . His instructions were to build an empire.

Jackson moved to Tidewater's executive offices in San Francisco in 1940 for a 7-year tour of duty. Then he was named president of Seaside Oil Co., then a marketing and refining associate.

The big job . . . Biggest single assignment in Jackson's career with Tidewater involved an economic survey of the company's eastern division.

Jackson's survey and recommendations led to two moves by Tidewater to pep up its eastern operations. They were abandonment of its outmoded, high-cost Bayonne refinery and construction of a mammoth new plant at Delaware City.

As a result, Jackson was named vice president and general manager of eastern operations.

Jackson left this post last August to join American Petrofina and has been a man on skates ever since getting the new company rolling.

Personals

Lewis V. S. Roos, senior seismologist with The Texas Co. in Houston, has been promoted to geophysicist, foreign operations, Western Hemisphere, for the company in New York.

Frederick P. Richter, formerly with the technical staff of the manufacturing department of General Petroleum Corp., West Coast affiliate of Socony Mobil Oil Co., has been named head of the technical division in Socony's new petroleum chemicals department.

Hugh McKee, formerly geologist with Tatham R. Eskrigee, has opened consulting offices in New Orleans.

Guy M. Houchins, geophysicist for Stanolind Oil & Gas Co., has been transferred to Oklahoma City from Jackson, Miss.

Sam B. Frazier, geologist for Gulf Refining Co. in Charles Town, W. Va., has been transferred to Gulf Oil Corp.'s southern Oklahoma district, Ardmore, Okla.

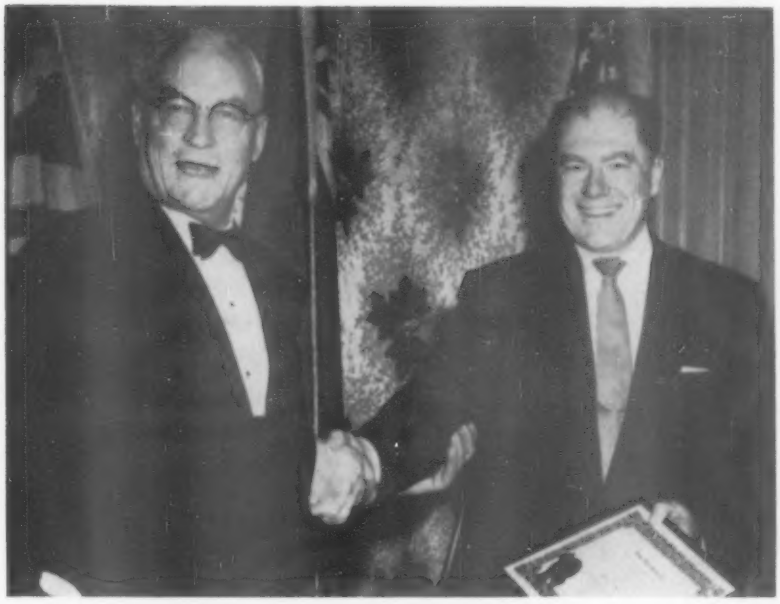
Kenneth O. Austin, formerly assistant division superintendent for General American Oil Co. of Texas in Tulsa, has joined Oilfield Research Laboratories as manager of their Okmulgee, Okla., office.

C. J. Lockwood, executive vice president and director of Socony Paint Products Co., has been elected president of the company, which is a subsidiary of Socony Mobil Oil Co., Inc. He succeeds **Sanford G. Lansing,** who has retired. **Robert M. Koppenhoefer,** coordinator of lubricants and allied products in Socony Mobil Laboratories, has been elected a director and vice president of Socony Paint Products.

John T. Cooke, manager of economic research for Sohio Petroleum Co. in Oklahoma City, has been named manager of foreign operations for Sohio's production department, excluding Canadian operations, which will continue under the Northwest Division, Billings, Mont. Cooke joined Sohio in 1947 as reservoir engineer. He has been manager of economic research in Oklahoma City since 1955.

Charles Henslee, geologist for Shamrock Oil & Gas Co. at Amarillo, Tex., has been transferred to San Antonio to open an exploration office there. **Charles Snow** will be district landman in the new office.

Harry Wright, geologist-scout for Cities Service Oil Co. in Lafayette, La., has been transferred to Olney, Ill., in the same capacity. **John Marek,** geologist-scout in Olney, has been transferred to Midland, Tex., and **John Thomas,** also formerly geologist-scout at Olney, has been transferred to Jackson, Miss.



Canadian Petroleum Association Awards

Two former western Canadian oil men received honorary life memberships in the Canadian Petroleum Association at its fourth annual dinner in Calgary. E. D. Loughney, vice president and director of British American Oil Co., Ltd., right, was presented his life membership certificate by J. J. Bowlen, lieutenant governor of Alberta. W. D. C. Mackenzie, director, Imperial Oil, Ltd., was the other recipient of life membership in the association.

W. H. Irons, production manager with Ashland Oil & Refining Co. in Oklahoma City, has joined Hilburn Industries, Inc., and Hilburn Drilling Co. in Shreveport, La.

H. W. Hurley, superintendent of Stanolind Oil & Gas Co.'s High Island area, will become field superintendent of the company's Spindletop area with headquarters in Beaumont, Tex., January 1. The Spindletop area will be enlarged to include the present High Island area. Hurley will succeed **W. G. Leach,** who will retire.

R. W. Dunlop, manager of the Sarnia, Ont., engineering division of Imperial Oil, Ltd., has been named assistant general manager of the manufacturing department. **C. P. Warkentin,** assistant manager of the engineering division, will succeed Dunlop.

Neal B. Lau Bach, vice president of Hudson Engineering Corp., Houston, has joined Colorado Interstate Gas Co. in Colorado Springs as vice president in charge of operations. Lau Bach has been with Hudson Engineering since 1947. He is a chemical engineering graduate of the University of Nebraska.

E. S. Parker has been named geological supervisor in Standard Oil Co. of California's Northern California division, exploration department. He succeeds **W. K. Gealey,** who has been transferred to California Exploration Co.

V. B. Marsh, field superintendent at Duncan, Okla., for Stanolind Oil & Gas Co., has been transferred to the company's new area production office in Monroe, La., as superintendent. **G. E. Lyons** will be field engineer in the new office and **P. H. Beggs** is production foreman.

J. F. Roorda, Jr., formerly an operating department manager at Shell Chemical Corp.'s Norco, La., plant, has been named assistant superintendent-technical at the company's Houston plant. Roorda succeeds **D. N. Rindsberg,** who has been promoted to assistant superintendent of operations at Houston.

Walt Guyer, who has been in charge of market analysis work in chemical research, Esso Research & Engineering Co. has been assigned to Esso Research, Ltd., London. He will succeed **Paul Smith** in the scientific liaison post, maintaining contact with European scientific societies, institutes and allied groups. Smith returns to chemical research after a 20-month tour of duty in London.

Personals

B. W. Squires, formerly geologist with Gibralter Oil Corp., has joined Halbert & Jennings in Denver as geologist.

Richard E. Morehouse, assistant to Carter Oil Co.'s exploration manager, Tulsa, has been transferred to Shreveport, La., as staff assistant to the southern division geologist.

D. M. Cox, manager of the petroleum products division at Esso Standard Oil Co.'s Baton Rouge, La., refinery, has been named assistant general manager of the company's supply department and transferred to New York. Cox has been with Esso since 1943.

ZIMMERMAN

Charles R. Zimmerman, J. B. Cookenboo, and **George D. List** have been elected directors of Houston Natural Gas Corp. Zimmerman, Tulsa, is executive vice president of Bethlehem Supply Co. He is a nephew of L. S. Zimmerman, chairman of the board of Houston Natural until his death in 1954. Cookenboo, Houston, is vice president and treasurer of Houston Natural. List is with Robert Garrett & Sons, Baltimore brokerage firm.

Vernon A. Bellman, domestic marketing manager for Socony Mobil Oil Co., Inc., has been named a director of the company. He will be director in charge of domestic marketing replacing **Herbert Willetts.** Willetts will have responsibility for employe relations and retains the position of director in charge of the petroleum chemicals department.

Raymond L. Tollett, president of Cosden Petroleum Corp., has been elected president and chairman of the board of Col-Tex Refining Co., subsidiary which Cosden acquired last month. Elected vice presidents and directors of Col-Tex were **Marvin M. Miller,** Cosden's senior vice president for exploration; **R. W. Thompson,** vice president in charge of production for Cosden; **Dan M. Krausse,** Cosden's vice president in charge of manufacturing; **R. M. Johnson;** and **R. O. Wilson.** Other officers of the company are **A. V. Karcher,** secretary, Cosden director; **L. T. King,** treasurer; and **V. A. Whittington,** assistant treasurer, Cosden assistant secretary and treasurer.

Personals

C. L. MERRELL

C. L. Merrell, assistant manager of Phillips Petroleum Co.'s foreign department with headquarters in Caracas, Venezuela, has been appointed manager. He will succeed **F. W. Floyd,** who is retiring January 1. Merrell has been assistant manager since August. Floyd joined Phillips as head of Venezuelan and Colombian operations in 1945. At that time he was technical coordinator for Creole Petroleum Corp. in Venezuela and had been a vice president of Carter Oil Co. before transferring to Venezuela. Floyd became manager of the foreign department and executive vice president of Phillips' Latin American subsidiaries in 1946.

John V. Boyce, formerly an Oklahoma City consultant, has been elected president and director of Texas Calgary Co., Abilene, Tex. He succeeds **Ray McGlothlin,** who has been elected to the new post of executive vice president. **E. R. E. Carter,** Toronto, Canada, has been elected a director of the company.

Norman L. Johnson, intermediate geologist for Sinclair Oil & Gas Co. in Portland, Ore., has been promoted to senior geologist and transferred to Tulsa. Johnson has been with Sinclair since 1954.

Frederick Stueck has been elected vice chairman of the Federal Power Commission for 1957. Stueck's term on the commission runs to June 22, 1959. He succeeds **Seaborn L. Digby** as vice chairman.

William C. Daugherty will be district production superintendent at a new district office at Hobbs, N. M., which will be opened by Magnolia Petroleum Co. January 1. Daugherty now is on special assignment in Magnolia's headquarters office at Dallas. **Lee Robinson,** now at Kermit, Tex., will move to the Hobbs office in charge of gas operations in the Kermit, Brownfield, and Hobbs districts.

Tom F. Davenport, Jr., Robert H. Waixel, and **Gus Nichols** have joined the research and development department of American Oil Co. at Texas City, Tex. Davenport will receive his Ph.D. degree in chemistry from the University of Texas in June. Waixel, previously with Jefferson Chemicals Co., is a graduate of Purdue University. Nichols is a 1954 graduate of the University of Athens.

New A.A.O.D.C. Regional Chapter Formed

The American Association of Oilwell Drilling Contractors' seventeenth regional chapter has been organized at New Orleans. The New Orleans region will include the area south of Baton Rouge and east of Morgan City in Louisiana and southern Mississippi. Officers of the chapter are, left to right, Earl G. Bateman, chairman, Bateman Drilling Co.; Charles A. Norton, vice chairman, Norton Drilling Co.; Brad Mills, A.A.O.D.C. executive vice president; and Charles F. Hayes, secretary-treasurer, Rimrock Tidelands, Inc.

F. J. Hodges, geophysicist for Shell Oil Co., has been transferred to Tulsa from Wichita.

J. B. Land, district engineer for The Texas Co. in Craig, Colo., has been transferred to Denver.

Robert W. Rea, section superintendent for Gulf Interstate Gas Co., has been transferred to Deville, La., from Banner, Miss.

Harold R. Park, formerly chief refinery engineer for Cities Service Oil Co., has joined Refinery Engineering Co. as assistant chief engineer.

Bob Cahn has been promoted by Esso Research & Engineering Co. to senior project engineer in the process engineering section of planning engineering.

W. J. (Bill) Lang, division staff geologist for Gulf Oil Corp. in Tulsa, has joined Lawson Petroleum Co. of Tulsa as chief geologist. A graduate of the University of Tulsa, Lang was previously with Carter Oil Co., Stanolind Oil & Gas Co., and Toklan Oil Corp.

L. T. WILSON

L. T. Wilson, manager of Shell Oil Co. of Canada's Montreal East refinery, has been appointed director of refining and supplies with Cia. Shell de Venezuela. Wilson joined Shell in 1933 at its Wilmington, Calif., refinery. He will be succeeded at Montreal by **J. L. Miller.**

Hinton J. Dillard, assistant chemist at Continental Oil Co.'s Denver refinery, has been promoted to resident chemist. **Robert Schlessman** will succeed Dillard.

Jewell T. Wood, formerly design engineer with Fell & Wheeler, consulting engineers in Tulsa, has joined **Jack B. Cornett** as partner in the firm of Cornett, Wood & Associates, consulting engineers, Tulsa.

D. W. Holland, district production engineer with Cities Service Oil Co., has been transferred to Russell, Kans., from Lindsay, Okla. **D. F. Presley,** Gladewater, Tex., has moved to Lindsay as district production engineer. **W. R. White,** production engineer for the company in Wichita Falls, Tex., has been promoted to district production engineer there.

West Central Texas Water-Flood Officers

These Abilene, Tex., oil men have been elected 1957 officers of the West Central Texas Waterflood Association. They are, seated, left to right, P. S. Ervin secretary-treasurer, North Glen Cove Operators Committee; Phil Bridges, chairman, Russell Engineering; K. K. Knapp, vice chairman, Kewanee Oil Co. Standing are four directors, left to right, Harry W. Elliott, Jr., West Central Drilling Co.; L. D. Webster, Katz Oil Co.; Dalton Moore, Jr., consulting engineer; and James E. Russell, Russell Engineering.

J. B. Ladd, district engineer for The Texas Co. in Craig, Colo., has been transferred to the company's division office in Denver.

R. L. Sedway, production engineer for Anderson-Prichard Oil Corp., has been transferred to Midland, Tex., from Oklahoma City.

J. E. Lewis has been appointed assistant to the district superintendent in Oklahoma City for Oklahoma Natural Gas Co. Lewis was formerly in Enid, Okla.

Gene Gessner, formerly with Sohio Petroleum Co., has joined Kerr-McGee Oil Industries, Inc., as engineering staff assistant to **C. H. Brady,** manager of the natural-gasoline department.

Laney G. Reed, seismologist for Sohio Petroleum Co., has been transferred to Oklahoma City from Lafayette, La.

R. B. Kelly, Jr., Denver area manager for Calvert Drilling Co., has been transferred to Fort Worth as Texas-New Mexico area manager. **James D. Craig,** formerly with Mesa Drilling Co. in Denver, has joined the company as head of the new Midland, Tex., office. In other appointments, **Allen Farmer,** drilling superintendent for Calvert in Fort Morgan, Colo., has been transferred to Bismarck, N. D., in the same capacity.

George E. Perry, junior exploitation engineer in Shell Oil Co.'s technical services division, Houston, has been appointed exploitation engineer, production, in the Denver division.

Personals

J. W. Peters, regional geophysicist for Mobil Producing Co. in Billings, Mont., has been elected president of the Montana Geophysical Society.

Harold J. Fitzgeorge, district geologist for Magnolia Petroleum Co., has been transferred to Wichita from Mount Vernon, Ill.

Leland Polling, formerly with H. C. Price Co. at Bartlesville, has joined Phillips Petroleum Co. in Amarillo, Tex., as geologist.

C. A. Cash, vice president of Shamrock Oil & Gas Corp., has been elected a director. He succeeds **Frank R. Denton,** who has resigned.

Harold L. Costello has been elected president and a director of Imperial Gas Co. He succeeds the late Philip Koch. Costello recently retired from the special products division of Standard Oil Co. of California.

Thomas C. Hiestand has resigned as vice president of Texota Oil & Gas Co. He will continue with Texota as a consultant. Hiestand, who will open consulting offices in Denver, also will serve as a consultant to Ambassador Oil Corp.

DEATHS

George Albert Simons, 84, Okmulgee, Okla., independent oil man, died recently in Tulsa. He was suffering from leukemia. Simons had a varied career in the oil industry beginning operations in the Oil City, Pa., area. He later operated in Oklahoma and Texas and spent a year in the Egyptian fields. He was connected with the Okmulgee Producing and Refining Association before becoming an independent.

Jack Anderson, 46, of Brush, Colo., manager of operations for Kaiser Exploration Co. in Costa Rica, was killed recently in British Honduras when the company plane he was traveling in crashed attempting a forced landing on a highway.

Gus D. Graham, 61, Rock Crossing, Tex., production superintendent for the Waggoner Estate, died recently. Graham had been associated with the Waggoner Estate since 1928.

John Whitten Hammond, 73, Tulsa independent, died December 19 in Tulsa of a heart ailment. Hammond had been in the drilling, producing, and leasing business for 27 years. He was one of the first oil men interested in the North Dakota area.

Victor Mauck, 82, retired chairman of the board of John Wood Manufacturing Co. and Nicolet Industries, Inc., died recently in Philadelphia. Mauck was the first to perfect the continuous welding of tube steel in large diameters and heavy gages. He was one of the founders of the American Welding Society.

Garland Prentis Fallis, 89, pioneer California oil man, died recently in Bakersfield, Calif. Fallis was one of the discoverers of the Signal Hill field at Long Beach.

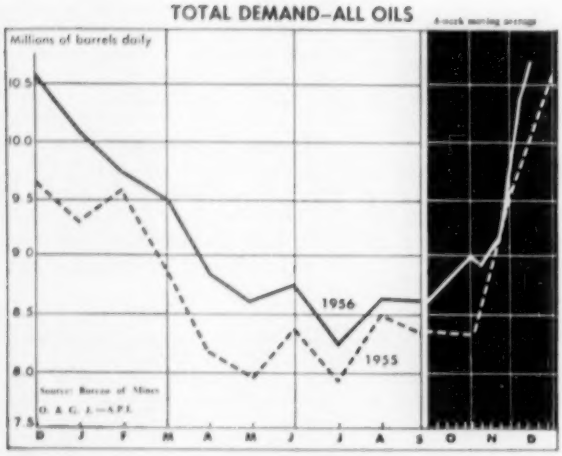
C. E. (Doc) O'Neal, 64, of C. E. O'Neal & Co., Evansville, Ind., oil producer and drilling contractor in the Tri-State area, died recently in Evansville of a heart condition.

V. Rue (Bud) Marichal, 68, general manager of Douglas Oil Co. of California, died recently in Long Beach, Calif.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,277,825	UP	5,375	UP	109,538
Crude stocks	273,617,000	DOWN	1,636,000	UP	16,697,000
Completions	1,241	UP	216	DOWN	8
Refinery runs	8,000,000	UP	135,000	UP	316,000
Gasoline stocks	177,037,000	UP	1,610,000	UP	16,631,000
Kerosine stocks	32,418,000	DOWN	693,000	UP	2,509,000
Distillate stocks	139,610,000	DOWN	5,940,000	UP	13,570,000
Residual stocks	43,145,000	DOWN	610,000	UP	2,210,000
Four-product stocks	392,210,000	DOWN	5,633,000	UP	34,920,000
Total imports	1,226,500	DOWN	457,900	DOWN	66,200



Demand for Crude, Surplus Gasoline Stocks Put Pressure on Refiners

AMERICAN refiners are facing the possibility of a crude-price increase and lower prices for gasoline.

Since the refiner posts prices he will pay for crude, as well as selling prices of products, even rumors of the above conditions indicate that refiners do not get together and set prices. A cut of half a cent in gasoline prices combined with a 50-cent increase per barrel for crude would narrow the profit margin by about 59 cents per barrel, or more than most refiners are making.

The squeeze on the refiner results from two situations—one which he created and the other in which he was only an influencing factor.

Gasoline markets are weak because refiners produced too much gasoline. Even in the last quarter of 1955, most operators would admit that stocks and production of motor fuel were too high for the country as a whole.

Refinery operations in this country represented only a small factor in the Middle East crisis. Increased use of Middle East crude by refiners on the East Coast meant a larger increase in demand for domestic crude when the transportation shortage developed following the closing of Suez and the pipelines through Syria.

The increase in export demand for crude has tended to place a premium on any crude delivered to Gulf Coast ports. If all demands for crude are to be met, some high-cost transportation will have to be used to move the crude to the coast. Someone will have to pay this added expense. In the absence of an over-all increase in crude prices, West Texas crude may be bringing two prices on the Gulf Coast, depending on how it got there.

Gasoline markets are softer . . . Group 3 gasoline prices are sagging again. There has not been enough price cutting to establish a new posting, but it seems to be on the way. Resellers are now buying pipeline-grade regular gasoline for 10.50 cents a gallon and premium for 12.25 cents. There have been rumors that some of the large independent jobbers are paying the same price.

If 10.50 cents becomes the normal spot price to independent jobbers, there will be pressure to lower tank-wagon prices on branded gasoline.

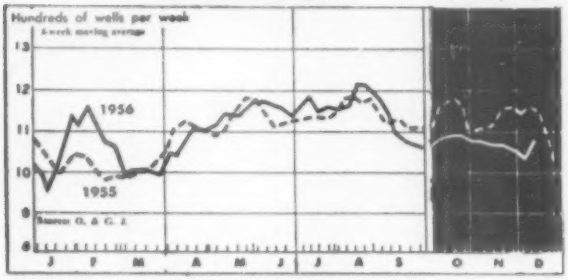
On the Gulf Coast, the formal quotation for 92-octane regular is 11.25 cents a gallon, but general market information in the area indicates that plenty of material is available at 0.375 cent under this quotation.

Heavy fuel is tight . . . There have been no reports of open offerings of residual fuel on the Gulf Coast. Formal quotations for cargoes show a low of $2.40 a barrel, but no one has any to offer at that price.

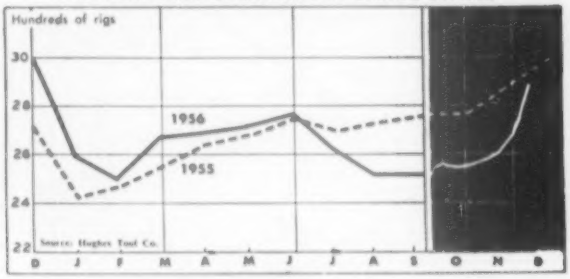
Some resellers seem to be betting that the price will go higher. There have been rumors of shipments to the Gulf Coast from Group 3 with premiums of as much as 25 cents a barrel over the Group 3 low. Resid with no sulfur guarantee carries a quoted low of $2.25 a barrel. The premium would bring the price to $2.50. Rail transportation to the Gulf Coast would add about $0.72 a barrel to give a total of $3.22 a barrel, not counting terminal costs. This total is at least $0.50 above the formal high of quotations on the Gulf Coast market.

Distillate prices moved up on the Group 3 market. Some suppliers are quoting 9.25 cents a gallon as the low for No. 2 fuel, but some material was moving at a lower price as late as Wednesday. Reliable reports indicate that no spot No. 2 distillate is moving on the Gulf Coast at less than 9.50 cents a gallon.

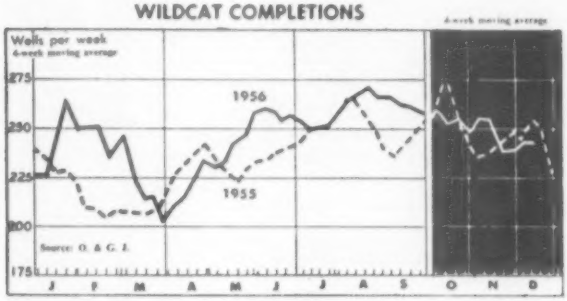
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	12-17-56	12-10-56	12-19-55
North Central and East	136	119	156
Southeast	42	39	30
Okla., Kans., Ark., Mo.	511	489	582
Louisiana	501	484	464
North and East Texas-Panhandle	478	463	476
Gulf and South Texas	290	280	311
West Texas-New Mexico	566	522	658
Rocky Mountain	256	256	312
Pacific Coast	114	114	148
Total United States	2,894	2,766	3,137
Western Canada	238	241	201

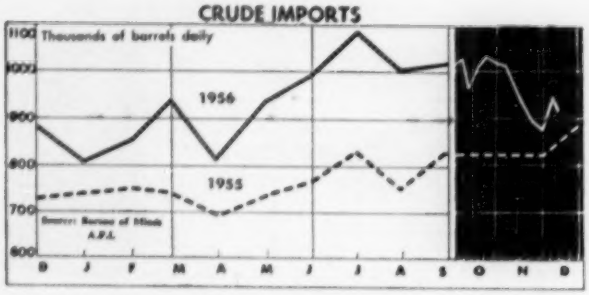
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 15, 1956

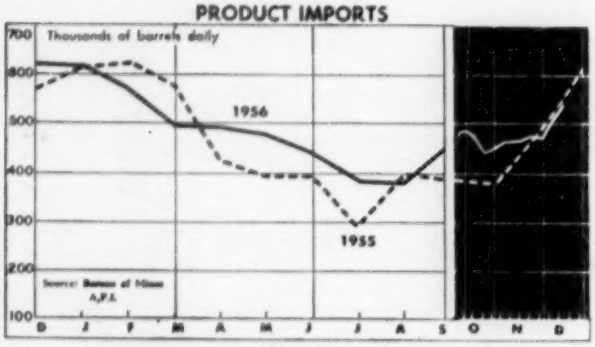
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1956				
	Comp.	Oil	Gas	Dry	Footage	1956	1955	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	1	0	1	18,501	107	71	0	0	0	1	1	0	0	1	49	50
Arkansas	36	29	0	7	92,960	944	792	1	0	0	3	4	33	0	7	138	178
California	40	29	1	10	180,224	2,143	2,344	1	0	0	9	10	48	0	9	440	497
Colorado	26	5	1	20	128,836	1,173	1,454	0	0	1	17	18	26	0	19	600	645
Illinois	37	15	0	22	87,050	3,664	3,792	0	0	0	3	3	49	0	5	689	743
Indiana	15	5	0	10	24,825	689	692	0	0	0	3	3	16	0	1	119	136
Kansas	100	38	6	156	328,374	4,750	4,849	2	0	1	22	25	121	4	41	867	1,033
Kentucky	64	35	3	26	65,361	1,857	1,566	1	0	0	12	13	40	0	0	384	424
Louisiana	93	42	20	31	740,746	3,658	3,908	2	0	2	14	18	113	49	61	513	736
North	37	15	9	13	143,242	1,617	2,019	0	0	0	7	7	32	2	3	214	251
South	46	20	11	15	501,116	1,638	1,889	0	0	2	5	7	63	41	43	261	408
Offshore	10	7	0	3	96,388	403		2	0	0	2	4	18	6	15	38	77
Michigan	13	6	0	7	37,303	421	503	0	0	0	6	6	9	0	2	151	162
Mississippi	15	3	0	12	90,763	422	439	0	0	0	8	8	18	1	1	189	209
Montana	30	10	0	20	108,276	471	388	0	0	0	11	11	11	0	1	169	181
Nebraska	5	1	0	4	31,199	882	870	0	0	0	1	1	38	0	1	396	435
New Mexico	38	16	9	13	163,761	1,840	1,650	1	0	1	4	6	53	1	10	205	269
Northwest	17	1	9	7	60,720	818	589	1	0	1	3	5	14	0	8	81	103
Southeast	21	15	0	6	103,041	1,022	1,061	0	0	0	1	1	39	1	2	124	166
North Dakota	1	0	0	1	5,360	254	247	0	0	0	1	1	8	0	0	67	75
Ohio	43	18	6	‡19	108,848	1,040	1,176	0	0	1	0	1	2	0	5	6	13
Oklahoma	150	96	0	‡54	486,358	7,804	8,255	4	0	0	10	14	125	20	38	645	828
Pennsylvania-New York	*168	82	10	§76	331,671	1,229	1,424	0	0	0	0	0	0	0	15	21	36
Texas	332	195	30	107	1,505,811	20,670	19,539	11	0	9	73	93	710	32	198	4,428	5,368
Southwest (1 & 4)	64	17	6	41	241,480	2,966	3,014	1	0	1	30	32	122	6	66	860	1,054
Gulf Coast (2 & 3)	44	13	14	17	297,900	2,527	2,444	0	0	6	8	14	63	16	78	678	835
East (5 & 6)	25	9	5	11	114,163	1,092	962	1	0	0	8	9	16	3	7	384	410
N. Central (7-B & 9)	76	48	1	27	242,328	7,337	7,290	5	0	0	20	25	317	0	12	1,755	2,084
West (7-C & 8)	99	92	0	7	510,817	5,481	4,801	3	0	0	6	9	172	0	12	679	863
Panhandle (10)	24	16	4	4	99,123	1,267	1,028	1	0	2	1	4	20	7	23	72	122
Utah	5	2	0	3	21,462	138	82	0	0	0	3	3	1	0	5	69	75
West Virginia	10	0	9	1	31,825	665	614	0	0	0	1	1	0	0	14	12	26
Wyoming	17	9	1	7	47,216	872	860	0	0	1	3	4	17	0	12	235	264
Miscellaneous (Mo.)	1	0	0	1	1,550	73	59	0	0	0	1	1	4	0	0	61	65
Total U. S.	1,241	637	96	508	4,638,280	55,766	55,574	23	0	16	206	245	1,442	107	446	10,453	12,448
Total previous week	1,025	511	74	440	4,165,637			27	1	16	240	284	1,419	107	430	10,247	12,203
Total Dec. 17, 1955	1,249	660	91	498	4,911,246			34	1	11	229	275	1,564	212	335	9,828	11,939
Cumulative 1956	55,766	29,967	3,955	21,844	223,555,376												
Western Canada	71	59	2	10	323,460	3,125											

Service wells included: †5, ‡7, §66. *Incl. revised figures.

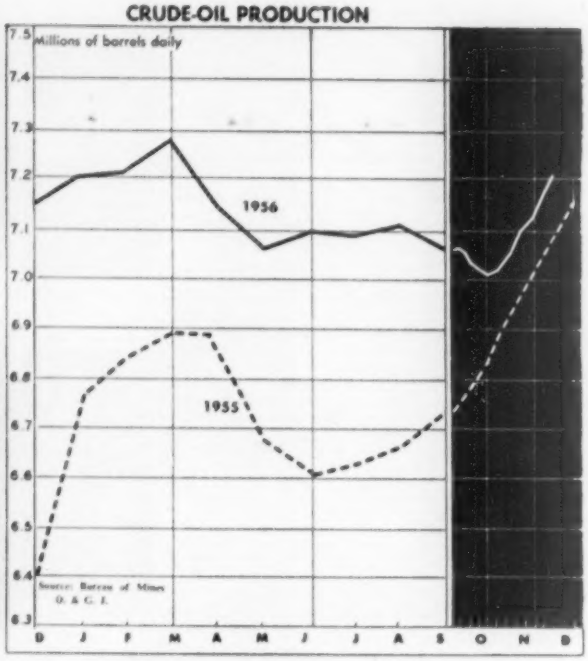
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

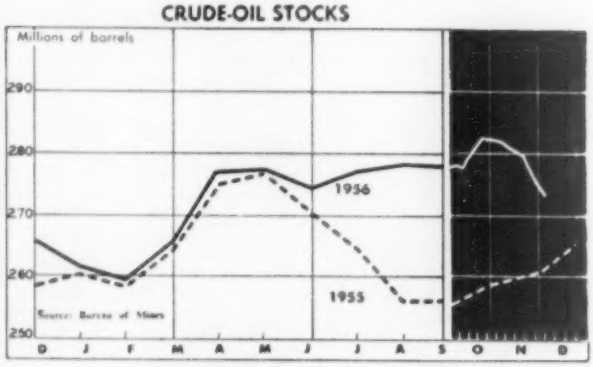


DAILY AVERAGE PRODUCTION FOR WEEK

	December 15, 1956			Dec. 8
	Crude oil	Lease condensate	Total	total
Alabama	10,500		10,500	11,250
Arkansas	77,860	240	78,100	79,325
California	951,800		951,800	950,800
Colorado	156,900		156,900	157,700
Eastern	49,600		49,600	49,000
Florida	1,300		1,300	1,300
Illinois	242,400		242,400	234,600
Indiana	32,400		32,400	31,600
Kansas	†333,100		†333,100	†335,700
Kentucky	45,500		45,500	45,200
Louisiana	819,500	77,700	897,200	897,400
North	128,500	2,700	131,200	131,400
South	691,000	75,000	766,000	766,000
Michigan	28,100		28,100	28,400
Mississippi	109,275	5,000	114,275	114,275
Montana	66,300		66,300	66,000
Nebraska	37,850		37,850	37,900
Nevada	200		200	200
New Mexico	241,950	4,350	246,300	246,350
North Dakota	34,300		34,300	32,550
Oklahoma	†599,850		†599,850	†601,500
Texas	3,002,000	55,900	3,057,900	3,057,900
Dist. 1	55,500	575	56,075	56,075
Dist. 2	144,600	8,700	153,300	153,300
Dist. 3	430,500	26,000	456,500	456,500
Dist. 4	230,000	6,800	236,800	236,800
Dist. 5	39,500	550	40,050	40,050
Dist. 6	127,000	6,300	133,300	133,300
East Texas field	207,900		207,900	207,900
Dist. 7-B	159,000	60	159,060	159,060
Dist. 7-C	166,000	4,500	170,500	170,500
Dist. 8	1,128,000	1,500	1,129,500	1,129,500
Dist. 9	208,000	690	208,690	208,690
Dist. 10	106,000	225	106,225	106,225
Utah	8,550		8,550	8,700
Wyoming	285,300		285,300	284,700
Others	‡100		‡100	‡100
Total U. S.	7,134,635	143,190	**7,277,825**	7,272,450
Change from prev. week, up			**5,375**	
Canada	†528,600		†528,600	†475,800
Total U. S. production, January 1-December 15			2,498,521,725 bbl.	
Same period last year (crude plus cond.)			*2,370,284,600 bbl.	

*Includes 39,565,100 bbl. of condensate. †Week ended previous Monday. ‡South Dakota.

CRUDE-OIL STOCKS



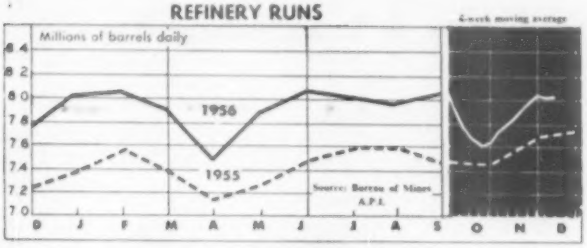
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

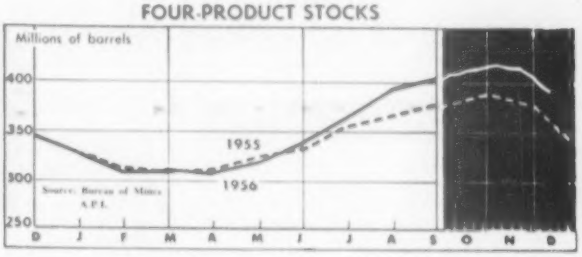
	12-8-56	12-1-56	12-10-55
Pennsylvania Grade	2,349	2,358	3,018
Other Appalachian	2,266	2,254	2,253
Illinois, Indiana, Michigan	11,750	11,405	9,404
Nebraska, North Dakota	2,293	2,128	2,124
Kansas	10,647	10,711	7,744
Oklahoma	23,441	23,974	21,245
Arkansas	2,905	2,801	2,528
Louisiana	18,771	17,442	16,358
North	2,456	2,561	2,733
South	16,315	14,881	13,625
Mississippi	3,066	3,272	2,770
New Mexico	7,618	7,933	7,658
Texas	122,560	124,881	121,356
East Texas proper	8,800	8,663	9,094
West Texas	58,957	59,363	57,466
Texas Gulf	23,256	24,370	24,359
Other Texas	31,547	32,485	30,437
Wyoming	16,631	16,944	15,141
Other Rocky Mountain	6,322	6,386	5,706
California	28,597	29,357	27,066
Foreign	†14,401	13,407	12,549
Total	273,617	275,253	256,920

*Bureau of Mines. †Includes 3,948,000 bbl. in California.

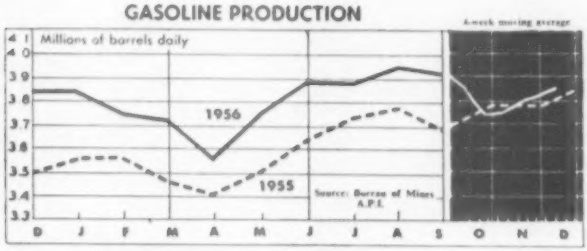
REFINERY RUNS



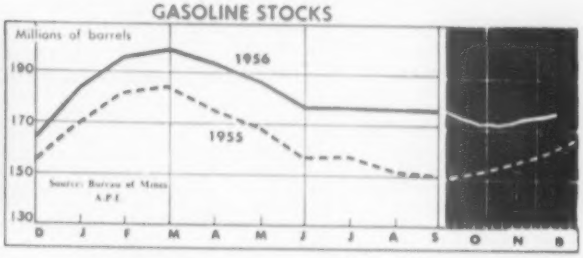
FOUR-PRODUCT STOCKS



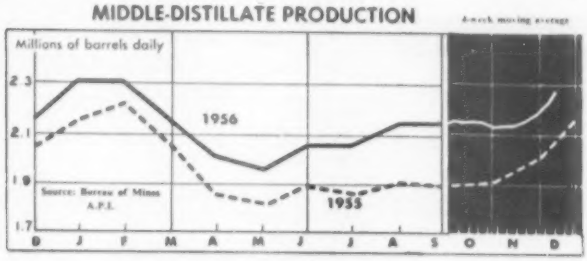
GASOLINE PRODUCTION



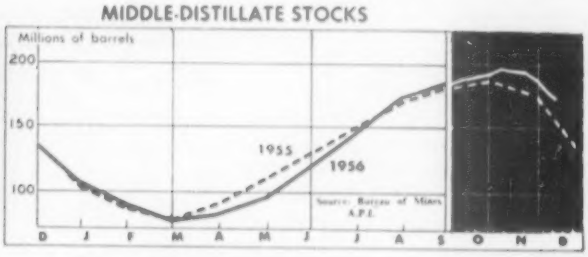
GASOLINE STOCKS



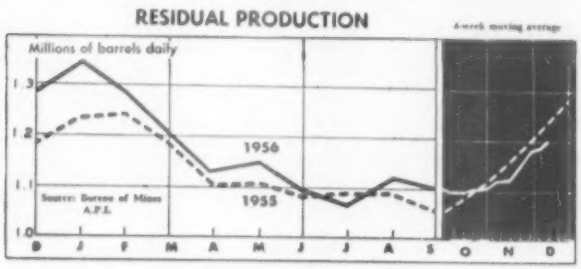
MIDDLE-DISTILLATE PRODUCTION



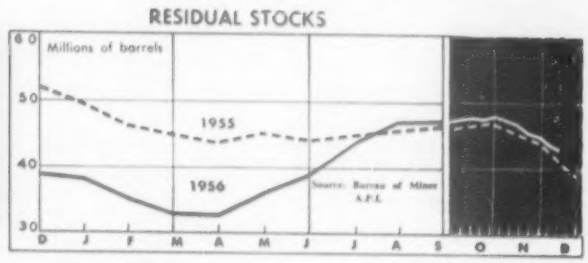
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, DECEMBER 14, 1956

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, December 1955: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,191	439.4	48.4	317.6	229.8	39,398	12,717	53,734	11,055	1,102	428.0	27.6	267.4	222.9
Appalachian:														
District 1	104	42.7	5.7	26.7	9.9	4,727	561	3,138	374	112	46.1	5.5	21.1	8.2
District 2	107	54.4	7.9	25.3	15.3	3,082	672	1,086	248	91	50.7	3.8	18.1	12.5
Ind., Ill., Ky.	1,411	755.7	82.1	302.1	217.7	30,158	6,981	21,584	5,592	1,375	751.2	73.3	272.1	192.8
Minn., Wis., Dak.	91	42.6	6.7	22.4	6.0	7,231	1,614	7,900	95	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	722	405.0	11.0	188.3	40.9	15,049	1,610	12,962	1,447	693	406.2	17.8	162.9	34.9
Inland Texas	268	201.2	14.1	46.6	16.9	7,096	619	1,952	1,782	251	186.8	9.8	47.2	19.0
Texas Gulf Coast	1,879	890.9	105.6	553.5	239.8	26,310	2,972	12,987	6,174	1,940	907.8	137.3	481.2	255.1
La. Gulf Coast	709	362.6	47.6	212.3	47.9	11,367	2,795	6,241	1,603	688	357.8	54.8	165.3	48.1
N. La. and Ark.	105	36.1	9.0	19.3	6.4	4,309	1,114	1,998	280	97	36.7	6.4	24.9	6.7
Rocky Mountain:														
New Mexico	27	15.0	0.6	5.3	4.3	504	10	120	67	22	11.0	0.4	3.9	2.6
Other Rocky Mt.	251	127.6	2.6	60.3	30.7	5,280	429	2,774	911	256	122.8	4.3	62.0	42.3
West Coast	1,135	493.4	4.1	163.4	328.7	22,526	324	13,134	13,517	1,065	482.7		153.7	368.6
Dec. 14, 1956	8,000	3,866.6	345.4	1,943.1	1,194.3	177,037	32,418	139,610	43,145	7,692	3,787.8	341.0	1,679.8	1,213.7
Dec. 7, 1956	7,865	3,891.0	412.1	1,885.4	1,194.3	175,427	33,111	145,550	43,755					
Dec. 16, 1955	7,684	3,867.0	346.9	1,725.3	1,231.9	160,406	29,909	126,040	40,935					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit and in pipelines. §Included in Indiana, Illinois, Kentucky district.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (88 octane)	10.75-11.50
Premium (96 octane)	12.50-13.25
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	12.75-13.25
Premium (98 octane)	13.00-13.50
California (rack):	
★ Regular (84 octane)	12.6-13.1
★ Premium (93 octane)	13.6-14.1
★ Premium (96 octane)	14.6-15.1
Caribbean area (cargoes):	
Regular (87 octane)	10.00
Premium (93 octane)	11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
★ Kerosine 42-44	10.125-10.25
★ Diesel oil (58 d.i. and above)	9.75-10.00
★ Distillate No. 1	9.75-10.00
★ Distillate No. 2	9.125-9.25
Gulf Coast (cargoes):	
Kerosine 41-43	9.75-10.25
Distillate No. 2	9.25-9.75
New York Harbor (barges):	
Kerosine 41-43	11.25
Distillate No. 2	10.65
Diesel fuel, 48-52 d.i.	10.95
Caribbean area (cargoes):	
Distillate No. 2	9.25

WAX (I.B.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.30-2.50
Gulf Coast (cargoes):	
★ Bunker C fuel	$2.40-2.70
New York Harbor (barges):	
Bunker C fuel	$3.05
Caribbean (cargoes):	
★ Bunker C	$2.40
California (rack):	
Bunker C fuel, Los Angeles	$2.50

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	27
200 vis. neutral (180 at 100°), 25 p.t.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.42				
15-15.9	2.46				$1.93
16-16.9	2.49				1.97
17-17.9	2.53				2.01
18-18.9	2.57				2.05
19-19.9	2.60				2.09
20-20.9	2.64	$2.50		$2.37	2.13
21-21.9	2.68	2.52		2.39	2.17
22-22.9	2.72	2.54		2.41	2.21
23-23.9	2.76	2.56		2.43	2.25
24-24.9	2.80	2.58	$3.01	2.45	2.28
25-25.9	2.84	2.60	3.03	2.47	2.31
26-26.9	2.88	2.62	3.05	2.49	2.34
27-27.9	2.92	2.64	3.07	2.51	2.37
28-28.9	2.97	2.66	3.09	2.53	2.40
29-29.9	3.02	2.68	3.11	2.55	2.43
30-30.9	3.07	2.70	3.13	2.57	2.46
31-31.9	3.13	2.72		2.59	2.49
32-32.9	3.19	2.74		2.61	2.52
33-33.9	3.25	2.76		2.63	2.55
34-34.9	3.31	2.78		2.65	2.58
35-35.9	3.36	2.80		2.67	2.61
36-36.9	3.40	2.82		2.69	2.64
37-37.9	3.43	2.84		2.71	2.66
38-38.9		2.86		2.73	2.68
39-39.9		2.88		2.75	2.70
40 and up		2.90		2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas. †Low-cold Texas, North Louisiana, Arkansas. †Low-cold-test Gulf. ‡Sour.

Effective dates: California, November 19, 1956; east of California, June 15, 1953; Pennsylvania Grade, August 16, 1956.

Some crudes in North Central Texas, West Central Texas, and Texas Panhandle have been shifted to the intermediate schedule with $2.83 for 40° and 2 cents per degree drop. Effective dates range from July 15, 1956, to August 10, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	4.68
Middle District	4.50
Southwest Pennsylvania	4.21
West Virginia	4.03
Buckeye Grade	4.07
Zanesville Grade	3.15
Illinois Basin	2.90
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	*2.80
Tia Juana medium, 26.5°-26.9°, Amuay§	†2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.35
Lagunillas heavy, flat, Amuay or Las Piedras§	2.20
Bachaquero, 14.5°-14.9°, Las Piedras§	‡1.91

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.69
Iraq, 36.0°-36.9°, Tripoli, Banias	2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
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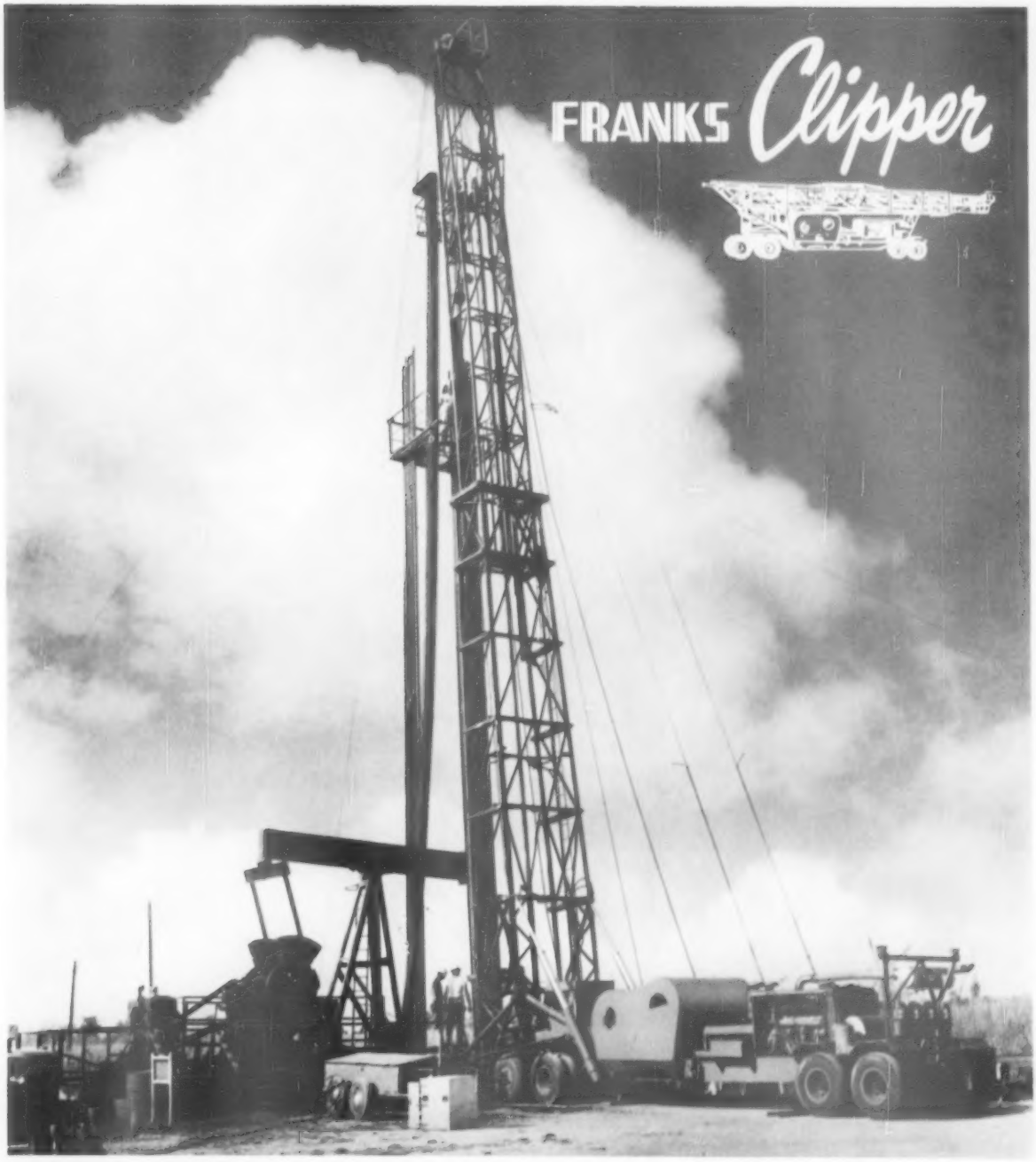

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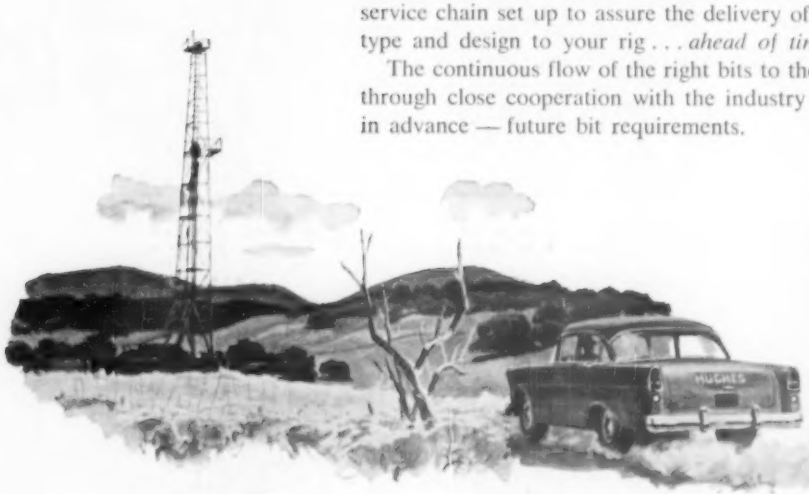
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